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Moving origins of coordinates

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ABSTRACT

In the moving (object) origin of coordinates, 2 algebraic relations, 2 differential equations can be compared with each other, and in the each, 2 moving objects relations can be obtained relative to each other. In the issue of the moving (object) origin of coordinates, mentioning some different examples will contribute to the problem understanding.

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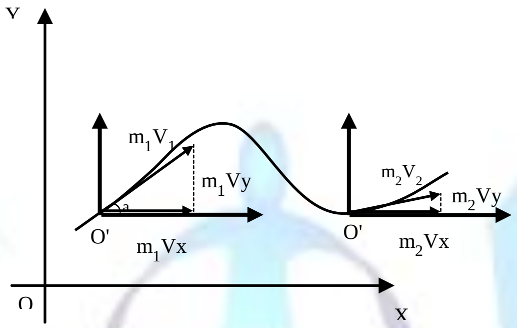
INTRODUCTION

In basic sciences such as math , physics , mechanics … and in order to show a relation or an equation , it is always shown or established on the static or fixed origin of coordinates . Regarding the print of the paper , "Application of Differential Equations in space" , in your periodical , it is shown that the moving object moves on differential equations , moving constantly on the fixed origin of coordinates in which case the movement of the moving object on differential equations in space does not depend on the mass of the moving object . y'$=\frac{m.Vy}{m.Vx}=\frac{Vy}{Vx}$

Moving origins of coordinates: In mechanical physics, where there is the discussion ofvelocity, mass also depends on it. That is , the moving object which enjoys velocity , it also enjoys a mass so that momentum (*m.V*) is the product of the moving object mass multiplied by the moving object velocity in the origin of coordinates oxy of a moving object with mass m_1 and velocity V_1 on any curve which enjoy motion .



The velocity of $m_1.V_1$ on 2 coordinates x and y equal: tan α = $y'_1=\frac{m1.Vy1}{m1.Vx1}=\frac{Vy1}{Vx1}$

Velocity coordinates: $o'_1\begin{cases}m_1Vx_1\\ m_1Vy_1\end{cases}$

Distance coordinates: $o'_1\begin{cases}x_1\\ y_1\end{cases}$

We can now claim that point o' , is the new origin of coordinates or the moving (object) origin of coordinates on system s_1 .

We now intend to study moving object $m_2.V_2$ relative to $m_1.V_1$.

Point o'_2 is the coordinates center on system s_2 . In order to obtain y' on the system (s_2 relative to s_1), we should initially write the following Eq. (sign + or – depends on the existence or nonexistence of images movement directionality):

$y'1,2=\frac{m_1.Vy_1-m_2.Vy_2}{m_1.Vx_1-m_2.Vx_2}$

Given 2 differential equations$\begin{cases}f(x_1,y_1,y'_1,c_1)=0\\ f(x_2,y_2,y'_2,c_2)=0\end{cases}$

We should initially apply the 2 differential equations (based on the paper print in periodical no."**JOURNAL OF ADVANCES IN MATHEMATICS** Vol .9, No 9 (February 3 , 2015 - ISSN 2 347-1921)" , and the review the movement of 2 moving object at point o'_1 and o'_2 relative to each other

Velocity coordinates: $o'_1\begin{cases}m_2Vx_2\\ m_2Vy_2\end{cases}$

Distance coordinates: $o'_2\begin{cases}x_2\\ y_2\end{cases}$

(x_1 , x_2) = Abscissa or distance from moving object o'_2 to moving object (o'_1) $x_2 = x_{1,2} + x_1 \Rightarrow x_{1,2} = x_2 - x_1$

(y_1 , y_2) = Ordinate or distance from moving object o'_2relative to moving object (o'_1) $y_2 = y_{1,2} + y_1 \Rightarrow y_{1,2} = y_2 - y_1$

By proving the relations of the 2 moving objects distance and velocity coordinates, we can now study the 2 differential equations written on system s_2 o s_1 relative to each other. The considerable point is that not any differential equation depends per se on the moving object mass for being applied. Yet, in order to apply 2 differential equation relative to each other, it does depend on masses of the 2 moving objects m_2 and m_1.

Now, by having 2 differential equations and relations ($x_{1,2}$, $y_{1,2}$, $y'_{1,2}$, $V_{1,2}$), the following relations can be written:

$$y'_{1,2}=\frac{m_1Vy1-m_2.Vy2}{m_1.Vx1-m_2.Vx2}$$

$$(1)\ V_{1,2}=\sqrt{(m_1.Vx_1-m_2.Vx_2)^2+(m_1.Vy_1-m_2.Vy_2)^2}$$

$$\begin{cases}(S_1)f(x_1,y_1,y'_1,c_1)=f(x1,y1,\frac{Vy_1}{Vx_1},c1)=0\\ (S_2)f(x_2,y_2,y'_2,c_2)=f(x2,y2,\frac{Vy_2}{Vx_2},c2)=0\end{cases}$$

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$0 < V \leq 300{,}000\ {}^{km}/_{sec}$

By specifying the numerical value of c_1, c_2, they can be defined for CNC machines, remote control machines , etc. The above mentioned relation is on plane oxy, and if we intend to apply 2 moving objects in space relative to each other for studying them, we specify the above mentioned relations om planes (oxy) , (oxz) and (oyz) and then write the momentum in space according to the following relation:

$$(m)\ V_{1,2} = \sqrt{(m_1.Vx_1 - m_2.Vx_2)^2 + (m_1.Vy_1 - m_2.Vy_2)^2 + (m_1.Vz_1 - m_2.Vz_2)^2}$$

$0 < V_{1,2} \leq 300{,}000\ {}^{km}/_{sec}$

Conclusion

Based on the relations specified in the moving (object) origin of coordinates, and by having the 2 equations of the moving object in space, we can obtain the movement equations of a moving object relative to the 2nd moving object.

Applications:

By presenting and established the moving (object) origin of coordinates it can briefly expressed that solution of differential equations in the framework of specified relations is investigable, and in this connection, the movement of 2 moving objects relative to each other depends on the masses m_2 and m1 of those 2 moving objects. This fact is visible at very very large distances and light years intervals from the earth or the earth origin of coordinates. For example, a moving object many light years away from the earth which is not controllable from the earth can be controlled via the 2nd moving object bying between the earth and the 1st moving object and be tracked based on the presented equation.

ABSTRACT

In the moving (object) origin of coordinates, 2 algebraic relations, 2 differential equations can be compared with each other, and in the each, 2 moving objects relations can be obtained relative to each other. In the issue of the moving (object) origin of coordinates, mentioning some different examples will contribute to the problem understanding.

Reference

Elements of Partial Differential Equations, Ian N. Sneddon

The formula

$$\left.\begin{aligned} \frac{z}{x} &= \tan \propto \\ \frac{z}{y} &= \tan \beta \\ \frac{y}{x} &= \tan \gamma \end{aligned}\right\} \tan \propto = \tan \beta \,.\, \tan \gamma$$

$${}^{dx}/_{dt} = Vx \quad {}^{dy}/_{dt} = Vy \quad {}^{dz}/_{dt} = Vz$$

tan α = tan β. tan γ is relevant to differential equations images on 3 coordinates OXY, OXZ and OYZ.

N.B.: Extra details have been avoided. The trend of the formulas proof is descriptive enough.

$s_1) \Rightarrow \frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ a=cte b=cte c=cte

$s_2) \Rightarrow A.x^2 + B.y + C.z = D$ A=cte B=cte C=cte D=cte

xoy $) \Rightarrow s_1) \Rightarrow \frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{0}{c^2} = 1 \Rightarrow \frac{{x_1}^2}{a^2} + \frac{{y_2}^2}{b^2} = 1$

$\frac{2.x_1.dx_1}{a^2} + \frac{2.}{}$

$\frac{x_1.Vx_1}{a^2} + \frac{y_1.V}{b^2}$

$b^2.x_1.Vx_1 + a^2.y_1.Vy_1 = 0 \Rightarrow {}^{Vy_1}/_{Vx_1} = \frac{-b^2.x_1}{a^2.y_1}$

$Vy_1 = \frac{-b^2.x_1}{a^2.\ y_1}.Vx_1$

xoz $) \Rightarrow s_1) \Rightarrow \frac{x^2_1}{a^2} + \frac{0}{b^2} + \frac{z^2_1}{c^2} = 1 \Rightarrow \frac{x^2_1}{a^2} + \frac{z^2_1}{c^2} = 1$

$$\frac{2.x_1.dx_1}{a^2}+\frac{2.z_1.dz_1}{c^2}=0 \Rightarrow \frac{2x_1.(dx/dt)_1}{a^2}+\frac{2z_1(dy/dt)_1}{c^2}=0$$

$$\frac{2.c^2.x_1.Vx_1+2a^2.z_1.Vz_1}{a^2.c^2}=0 \Rightarrow c^2.x_1.Vx_1+a^2.z_1.Vz_1=0$$

$$Vz_1=\frac{-c^2.x_1}{a^2.z_1}.Vx_1$$

xoy) $\Rightarrow$ s_2) $A.x^2_2 + B.y_2 + C.z_2 = D$

$A.x^2_2 + B.y_2 = D \Rightarrow 2.A.x_2.dx_2 + B.dy_2 = 0$

$2.A.x_2.(dx/dt)_2 + B.(dy/dt)_2 = 0 \Rightarrow 2.A.x_2.Vx_2 + B.Vy_2 = 0$

$Vy_2/Vx_2 = \frac{-2.A.x_2}{B} \Rightarrow Vy_2 = \frac{-2.A.x_2}{B}.Vx_2$

xoz) = s2) $\Rightarrow$ $A.x^2_2 + B(0) + C.z_2 = D$

$2.Ax_2.dx_2 + C.dz_2 = 0 \Rightarrow 2.A.x_2.(dx/dt)_2 + C.(dz/dt)_2 = 0$

$2.A.x_2.Vx_2 + C.Vz_2 = 0 \Rightarrow Vz_2/Vx_2 = \frac{-2.A.x_2}{c} \Rightarrow \Rightarrow Vz_2 = \frac{-2.A.x_2}{C}.Vx_2$

$$y'_{1,2}=\frac{m_1.Vy_1-m_2.Vy_2}{m_1.Vx_1-m_2.Vx_2} \Rightarrow \begin{cases} m_1.Vy_1 = m_1.(\frac{-b^2.x_1}{a^2.y_1}).Vx_1 \\ m_2.Vy_2 = m_2.(\frac{-2.A}{B}.x_2).Vx_2 \end{cases}$$

$$y'_{1,2}=\frac{m_1.(\frac{-b^2.x_1}{a^2.y_1}).Vx_1-m_2.(\frac{-2.A}{B}.x_2).Vx_2}{m_1.Vx_1-m_2.Vx_2}$$

$$o'_{1,2}=\begin{cases} x_{1,2}=x_2-x_1 \\ y_{1,2}=y_2-y_1 \end{cases} \qquad o'_{1,2}=\begin{cases} m_1.Vx_{1,2}=m_1.Vx_1-m_2Vx_2 \\ m_{1,2}.Vy_{1,2}=m_1.Vy_1-m_2.Vy_2 \end{cases}$$

1-1 $y' + 2.y = e^{-x} \Rightarrow Vy/Vx + 2.y = e^{-x} \Rightarrow$

s_1) $\Rightarrow \frac{m_1.Vy_1}{m_1.Vx_1} + 2.y_1 = e^{-x_1}$

1-2 $x^2.y' + 3.x.y = \frac{\sin x}{x} \Rightarrow x^2.Vy/Vx + 3.x.y = \frac{\sin x}{x} \Rightarrow$

s_2) $\Rightarrow \frac{x^2_2.m_2.Vy_2}{m_2.Vx^2_2} + 3.x_2.y_2 = \frac{\sin x_2}{x_2}$

$$\frac{s_2}{s_1}) \Rightarrow \begin{cases} y'_{1,2}=\dfrac{m_1.Vy_1-m_2.Vy_2}{m_1.Vx_1-m_2.Vx_2} \\ o'_{1,2}=\begin{cases} x_{1,2}=x_2-x_1 \\ y_{1,2}=y_2-y_1 \end{cases} \end{cases} \qquad \text{I}$$

$$o'_{1,2}=\begin{cases} m_{1,2}.Vx_{1,2}=m_2.Vx_2-m_1Vx_1 \\ m_{1,2}.Vy_{1,2}=m_2.Vy_2-m_1.Vy_1 \end{cases} \qquad \text{J}$$

$$m.V_{1,2}=\sqrt{(m_{1,2}.Vx_{1,2})^2+(m_{1,2}.Vy_{1,2})^2}=\sqrt{(m_2.Vx_2-m_1.Vx_1)^2+(m_2.Vy_2-m_1.Vy_1)^2} \qquad \text{K}$$

Based on theprovidedsoftware I , J , K

2-1 $y' + \frac{y}{x} = 3\cos^2 x \Rightarrow Vy/Vx + \frac{y}{x} = 3\cos^2 x$, $\Rightarrow$

s_1) $\Rightarrow \frac{m_1.Vy_1}{m_1.Vx_1} + \frac{y_1}{x_1} = 3\cos^2 x_1$ I

2-2 $y' + y = xe^x \Rightarrow Vy/Vx + y = xe^x \Rightarrow$

s_2) $\Rightarrow \frac{m_2.Vy_2}{m_2.Vx_2} + y_2 = x_2 e^{x_2}$

$$\frac{s_2}{s_1}) \Rightarrow \begin{cases} y'_{1,2} = \dfrac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \end{cases} \end{cases}$$ J

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1.Vy_1 \end{cases}$$

$$m.V_{1,2} = \sqrt{(m_{1,2}.Vx_{1,2})^2 + (m_{1,2}.Vy_{1,2})^2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2}$$

Based on theprovidedsoftware I , J , K

3-1 $y'+y.\tan x = x.\sin^2 x \Rightarrow {}^{Vy}/_{Vx} + y.\tan x = x.\sin^2 x$, $\Rightarrow$

$$s_1) \Rightarrow \frac{m_1.Vy_1}{m_1.Vx_1} + y_1.\tan x_1 = x_1.\sin^2 x_1$$

3-2 $y' + \frac{2xy}{1+x^2} = \frac{1}{1+x^2} \Rightarrow {}^{Vy}/_{Vx} + \frac{2xy}{1+x^2} = \frac{1}{1+x^2} \Rightarrow$

$$s_2) \Rightarrow \frac{m_2.Vy_2}{m_2.Vx_2} + \frac{2x_2y_2}{1+x^2_2} = \frac{1}{1+x^2_2}$$

$$\frac{s_2}{s_1}) \Rightarrow \begin{cases} y'_{1,2} = \dfrac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \end{cases} \end{cases}$$ I

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1.Vy_1 \end{cases}$$ J

$$m.V_{1,2} = \sqrt{(m_{1,2}.Vx_{1,2})^2 + (m_{1,2}.Vy_{1,2})^2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2}$$ K

Based on theprovidedsoftware I , J , K

4-1 $y'+x^2y = 1 \Rightarrow {}^{Vy}/_{Vx} + x^2y = 1 \Rightarrow$

$$s_1) \Rightarrow \frac{m_1.Vy_1}{m_1.Vx_1} + x^2{}_1y_1 = 1$$

4-2 $y' + 4y(\tan^2 x) = \tan^2 x \Rightarrow {}^{Vy}/_{Vx} + 4y(\tan^2 x) = \tan^2 x \Rightarrow$

$$s_2) \Rightarrow \frac{m_2.Vy_2}{m_2.Vx_2} + 4y_2(\tan^2 x_2)$$

$$\frac{s_2}{s_1}) \Rightarrow \begin{cases} y'_{1,2} = \dfrac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \end{cases} \end{cases}$$ I

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1.Vy_1 \end{cases}$$ J

$$m.V_{1,2} = \sqrt{(m_{1,2}.Vx_{1,2})^2 + (m_{1,2}.Vy_{1,2})^2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2}$$ K

Based on theprovidedsoftware I , J , K

5-1 $xy'(\log_n x) = x\log_n(x-y) \Rightarrow x\frac{Vy}{Vx}(\log_n x) = x\log_n(x-y) \Rightarrow$

$$s_1) \Rightarrow x_1 \frac{m_1.Vy_1}{m_1.Vx_1}(\log_n x_1) = x_1\log_n(x_1 - y_1)$$

5-2 $y' = (-\cos x)y + 6\cos^2 x \Rightarrow {}^{Vy}/_{Vx} = (-\cos x)y + 6\cos^2 x \Rightarrow$

$$s_2) \Rightarrow \frac{m_2.Vy_2}{m_2.Vx_2}(-\cos x_2)y_2 + 6\cos^2 x_2$$

I

$$\frac{s_2}{s_1})\Rightarrow \begin{cases} y'_{1,2} = \frac{m_1.Vy_1-m_2.Vy_2}{m_1.Vx_1-m_2.Vx_2} \\ o'_{1,2} = \begin{cases} x_{1,2} = x_2-x_1 \\ y_{1,2} = y_2-y_1 \end{cases} \end{cases}$$

J

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1.Vy_1 \end{cases}$$

$$m.V_{1,2} = \sqrt{(m_{1,2}.Vx_{1,2})^2+(m_{1,2}.Vy_{1,2})^2} = \sqrt{(m_2.Vx_2-m_1.Vx_1)^2+(m_2.Vy_2-m_1.Vy_1)^2}$$

K

Based on theprovidedsoftware I , J , K

6-1 $y(zx^2y^3+3)dx+x(x^2y^3-1)dy=0 \Rightarrow y(zx^2y^3+3)\frac{dx}{dt}+x(x^2y^3-1)\frac{dy}{dt}=0 \Rightarrow y(zx^2y^3+3)Vx+x(x^2y^3-1)Vy=0 \Rightarrow$ z=cte
$s_1)\Rightarrow y_1(zx^2{}_1y^3{}_1+3)m_1.Vx_1+x_1(x^2{}_1y^3{}_1-1)m_1.Vy_1=0$

6-2 $(y^2+yx^2)dx+(x^3-3xy)dy=0 \Rightarrow (y^2+yx^2)\frac{dx}{dt}+(x^3-3xy)\frac{dy}{dt}=0 \Rightarrow (y^2+yx^2)Vx+(x^3-3xy)Vy=0 \Rightarrow$

I

$s_2)\Rightarrow (y^2{}_2+y_2x^2{}_2)m_2.Vx_2+(x^3{}_2-3x_2y_2)m_2.Vy_2$

$$\frac{s_2}{s_1})\Rightarrow \begin{cases} y'_{1,2} = \frac{m_1.Vy_1-m_2.Vy_2}{m_1.Vx_1-m_2.Vx_2} \\ o'_{1,2} = \begin{cases} x_{1,2} = x_2-x_1 \\ y_{1,2} = y_2-y_1 \end{cases} \end{cases}$$

J

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1.Vy_1 \end{cases}$$

$$m.V_{1,2} = \sqrt{(m_{1,2}.Vx_{1,2})^2+(m_{1,2}.Vy_{1,2})^2} = \sqrt{(m_2.Vx_2-m_1.Vx_1)^2+(m_2.Vy_2-m_1.Vy_1)^2}$$

Based on theprovidedsoftware I , J , K

7-1 $y(2-3xy)dx-xdy=0 \Rightarrow y(2-3xy)\frac{dx}{dt}-x\frac{dy}{dt}=0 \Rightarrow y(2-3xy)Vx-x.Vy=0 \Rightarrow$

K

$s_1)\Rightarrow y_1(2-3x_1y_1)m_1.Vx_1-x_1.m_1.Vy_1=0$

7-2 $(4xy+3y^4)dx+(2x^2+5xy^3)dy=0 \Rightarrow (4xy+3y^4)\frac{dx}{dt}+(2x^2+5xy^3)\frac{dy}{dt}=0 \Rightarrow (4xy+3y^4).Vx+(2x^2+5xy^3).Vy=0 \Rightarrow$

$s_2)\Rightarrow (4xy_2+3y^4{}_2)m_2.Vx_2+(2x^2{}_2+5xy^3{}_2)m_2.Vy_2$

$$\frac{s_2}{s_1})\Rightarrow \begin{cases} y'_{1,2} = \frac{m_1.Vy_1-m_2.Vy_2}{m_1.Vx_1-m_2.Vx_2} \\ o'_{1,2} = \begin{cases} x_{1,2} = x_2-x_1 \\ y_{1,2} = y_2-y_1 \end{cases} \end{cases}$$

I

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1.Vy_1 \end{cases}$$

J

$$m.V_{1,2} = \sqrt{(m_{1,2}.Vx_{1,2})^2+(m_{1,2}.Vy_{1,2})^2} = \sqrt{(m_2.Vx_2-m_1.Vx_1)^2+(m_2.Vy_2-m_1.Vy_1)^2}$$

K

Based on theprovidedsoftware I , J , K

8-1 $y(x^4y-1)dx+x(xy^4-1)dy=0 \Rightarrow y(x^4y-1)\frac{dx}{dt}+x(xy^4-1)\frac{dy}{dt}=0 \Rightarrow y(x^4y-1)Vx+x(xy^4-1)Vy=0 \Rightarrow$

$s_1)\Rightarrow y_1(x^4{}_1y_1-1)Vx_1+x_1({}_1xy^4{}_1-1)Vy_1 = y_1(x^4{}_1y_1-1).m_1Vx_1+x_1({}_1xy^4{}_1-1)m_1.Vy_1$

8-2 $(y^2+2xy+y)dx-(2xy+x^2-x)dy=0 \Rightarrow (y^2+2xy+y)\frac{dx}{dt}-(2xy+x^2-x)\frac{dy}{dt}=0 \Rightarrow (y^2+2xy+y)Vx-(2xy+x^2-x)Vy=0 \Rightarrow s_2$
$)\Rightarrow (y^2{}_2+2x_2y_2+y_2)Vx_2-(2x_2y_2+x^2{}_2-x_2)Vy_2=(y^2{}_2+2x_2y_2+y_2)m_2.Vx_2-(2x_2y_2+x^2{}_2-x_2)m_2.Vy_2$

$$\frac{s_2}{s_1})\Rightarrow \begin{cases} y'_{1,2} = \frac{m_1.Vy_1-m_2.Vy_2}{m_1.Vx_1-m_2.Vx_2} \\ o'_{1,2} = \begin{cases} x_{1,2} = x_2-x_1 \\ y_{1,2} = y_2-y_1 \end{cases} \end{cases}$$

I

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1.Vy_1 \end{cases}$$

$$m.V_{1,2} = \sqrt{(m_{1,2}.Vx_{1,2})^2+(m_{1,2}.Vy_{1,2})^2} = \sqrt{(m_2.Vx_2-m_1.Vx_1)^2+(m_2.Vy_2-m_1.Vy_1)^2}$$

J

Based on theprovidedsoftware I , J , K

9-1 $(2x^2y+y^2)dx+(2x^3-xy)dy=0 \Rightarrow (2x^2y+y^2)\frac{dx}{dt}+(2x^3-xy)\frac{dy}{dt}=0 \Rightarrow (2x^2y+y^2)Vx+(2x^3-xy)Vy=0 \Rightarrow$ K

$s_1) \Rightarrow (2x^2{}_1y_1+y^2{}_1)Vx_1+(2x^3{}_1-x_1y_1)Vy_1=(2x^2{}_1y_1+y^2{}_1)m_1.Vx_1+(2x^3{}_1-x_1y_1)m_1.Vy_1$

9-2 $y(4x+3y^2)dx+x(2x+4y^2)dy=0 \Rightarrow y(4x+3y^2)\frac{dx}{dt}+x(2x+4y^2)\frac{dy}{dt}=0 \Rightarrow y(4x+3y^2)Vx+x(2x+4y^2)Vy=0 \Rightarrow$

$s_2) \Rightarrow y_2(4x_2+3y^2{}_2)Vx_2+x_2(2x_2+4y^2{}_2)Vy_2=y_2(4x_2+3y^2{}_2)m_2.Vx_2+x_2(2x_2+4y^2{}_2)m_2.Vy_2$

$$\frac{s_2}{s_1}) \Rightarrow \begin{cases} y'_{1,2} = \dfrac{m_1.Vy_1-m_2.Vy_2}{m_1.Vx_1-m_2.Vx_2} \\ o'_{1,2} = \begin{cases} x_{1,2}=x_2-x_1 \\ y_{1,2}=y_2-y_1 \end{cases} \end{cases}$$ I

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2}=m_2.Vx_2-m_1Vx_1 \\ m_{1,2}.Vy_{1,2}=m_2.Vy_2-m_1.Vy_1 \end{cases}$$ J

$$m.V_{1,2}=\sqrt{(m_{1,2}.Vx_{1,2})^2+(m_{1,2}.Vy_{1,2})^2}=\sqrt{(m_2.Vx_2-m_1.Vx_1)^2+(m_2.Vy_2-m_1.Vy_1)^2}$$ K

Based on theprovidedsoftware I , J , K

10-1 $\frac{dy}{dx}=\frac{-y(\tan x+\log_n y)}{\tan x} \Rightarrow \frac{dy/dt}{dx/dt}=\frac{-y(\tan x+\log_n y)}{\tan x} \Rightarrow \frac{Vy}{Vx}=\frac{-y(\tan x+\log_n y)}{\tan x} \Rightarrow$

$s_1) \Rightarrow \frac{m_1.Vy_1}{m_1.Vx_1}=\frac{-y_1(\tan x_1+\log_n y_1)}{\tan x_1}$

10-2 $\frac{dy}{dx}=\frac{(2y+3xy^2)}{3x+4yx^2} \Rightarrow \frac{dy/dt}{dx/dt}=+\frac{2y+3xy^2}{3x+4yx^2} \Rightarrow \frac{Vy}{Vx}=\frac{2y+3xy^2}{3x+4yx^2} \Rightarrow$

$s_2) \Rightarrow \frac{m_2.Vy_2}{m_2.Vx_2}=\frac{2y_2+3x_2y^2{}_2}{3x_2+4y_2x^2{}_2}$

$$\frac{s_2}{s_1}) \Rightarrow \begin{cases} y'_{1,2} = \dfrac{m_1.Vy_1-m_2.Vy_2}{m_1.Vx_1-m_2.Vx_2} \\ o'_{1,2} = \begin{cases} x_{1,2}=x_2-x_1 \\ y_{1,2}=y_2-y_1 \end{cases} \end{cases}$$ I

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2}=m_2.Vx_2-m_1Vx_1 \\ m_{1,2}.Vy_{1,2}=m_2.Vy_2-m_1.Vy_1 \end{cases}$$ J

$$m.V_{1,2}=\sqrt{(m_{1,2}.Vx_{1,2})^2+(m_{1,2}.Vy_{1,2})^2}=\sqrt{(m_2.Vx_2-m_1.Vx_1)^2+(m_2.Vy_2-m_1.Vy_1)^2}$$ K

1-1 $y.dx+x.dy+2.z.dz=0 \Rightarrow y.dx/dt+x.dy/dt+2.z.dz/dt \Rightarrow y.Vx+x.Vy+2.z.Vz=0 \Rightarrow$

Based on theprovidedsoftware I , J , K

$s_1) \Rightarrow y_1.Vx_1+x_1.Vy_1+2.z_1.Vz_1=0$ E

1-2 $z.(z+y)dx+z.(z+x)dy-2.x.dz=0 \Rightarrow z.(z+y)dx/dt+z.(z+x)\,dy/dt-2.x.dz/dt=0 \Rightarrow z.(z+y).Vx+$

$z.(z+x).Vy-2.x.Vz=0 \Rightarrow$

$s_2) \Rightarrow z_2.(z_2+y_2).Vx_2+z_2.(z_2+x_2).Vy_2-2.x_2.Vz_2=0$

$$s_2/s_1) \Rightarrow \begin{cases} y'_{1,2} = \dfrac{m_1.Vy_1-m_2.Vy_2}{m_1.Vx_1-m_2.Vx_2} \\ z'_{1,2} = \begin{cases} \dfrac{m_1.Vz_1-m_2.Vz_2}{m_1.Vx_1-m_2.Vx_2} \end{cases} \end{cases}$$ F

$$o'_{1,2} = \begin{cases} x_{1,2}=x_2-x_1 \\ y_{1,2}=y_2-y_1 \\ z_{1,2}=z_2-z_1 \end{cases}$$

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2}=m_2.Vx_2-m_1Vx_1 \\ m_{1,2}.Vy_{1,2}=m_2.Vy_2-m_1Vy_1 \\ m_{1,2}.Vz_{1,2}=m_2.Vz_2-m_1Vz_1 \end{cases}$$ G

$$m_{1,2}.V_{1,2}=\sqrt{(m_2.Vx_2-m_1.Vx_1)^2+(m_2.Vy_2-m_1.Vy_1)^2+(m_2.Vz_2-m_1.Vz_1)^2}$$ H

Based on theprovidedsoftware E,F,G,H

2-1 $y.z.dx + 2.x.z.dy - 3.x.y.dz = 0 \Rightarrow y.z.{}^{dx}/_{dt} + 2.x.z.{}^{dy}/_{dt} - 3.x.y.{}^{dz}/_{dt} = 0 \Rightarrow y.z.Vx + 2.x.z.Vy - 3.x.y.Vz = 0$

$s_1) \Rightarrow y_1.z_1.Vx_1 + 2.x_1.z_1.Vy_1 - 3.x_1.y_1.Vz_1 = 0$

2-2 $2.x.z.dx + z.dy - dz = 0 \Rightarrow 2.x.z\,{}^{dx}/_{dt} + z.{}^{dy}/_{dt} - {}^{dz}/_{dt} = 0 \Rightarrow 2.x.z.Vx + z.Vy - Vz = 0$ E

$s_2) \Rightarrow 2.x_2.z_2.Vx_2 + z_2.Vy_2 - Vz_2 = 0$

$$s_2/s_1) \Rightarrow \begin{cases} y'_{1,2} = \dfrac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \left\{ \dfrac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2} \right. \end{cases}$$

F

$$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$$

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$$

G

H Based on theprovidedsoftware E,F,G,H

$$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$$

3-1 $(y^2+x.z).dx + (x^2+y.z).dy + 3.z^2.dz = 0 \Rightarrow (y^2+x.z).{}^{dx}/_{dt} + (x^2+y.z){}^{dy}/_{dt} + 3.z^2.{}^{dz}/_{dt} = 0 \Rightarrow (y^2+x.z).Vx + (x^2+y.z).Vy + 3.z^2.Vz = 0$

$s_1) \Rightarrow (y^2_1+x_1.z_1).Vx_1 + (x^2_1+y_1.z_1).Vy_1 + 3.z^2_1.Vz_1 = 0$

3-2 $(x^2.z-y^3).dx + 3.x.y^2.dy + x^3.dz = 0 \Rightarrow (x^2.z-y^3).{}^{dx}/_{dt} + 3.x.y^2.{}^{dy}/_{dt} + x^3{}^{dz}/_{dt} = 0 \Rightarrow (x^2.z-y^3).Vx + 3.x.y^2.Vy + x^3.Vz = 0$

$s_2) \Rightarrow (x^2_2.z_2-y^3_2).Vx_2 + 3.x_2.y^2_2.Vy_2 + x^3_2.Vz_2 = 0$

E

$$s_2/s_1) \Rightarrow \begin{cases} y'_{1,2} = \dfrac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \left\{ \dfrac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2} \right. \end{cases}$$

$$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$$

F

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$$

G

H Based on theprovidedsoftware E,F,G,H

$$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$$

4-1 $a^2.y^2.z^2.dx + b^2.z^2.x^2.dy + c^2.x^2.y^2.dz = 0 \Rightarrow a^2.y^2.z^2.{}^{dx}/_{dt} + b^2.z^2.x^2.{}^{dy}/_{dt} + c^2.x^2.y^2.{}^{dz}/_{dt} = 0 \Rightarrow a^2.y^2.z^2.Vx + b^2.z^2.x^2.Vy + c^2.x^2.y^2.Vz = 0$

a=cte
b=cte
b=cte

$s_1) \Rightarrow a^2.y^2_1.z^2_1.Vx_1 + b^2.z^2_1.x^2_1.Vy_1 + c^2.x^2_1.y^2_1.Vz_1 = 0$

4-2 $x(y^2-a^2).dx + y(x^2-z^2).dy - z(y^2-a^2).dz = 0 \Rightarrow x(y^2-a^2).{}^{dx}/_{dt} + y(x^2-z^2).{}^{dy}/_{dt} - z(y^2-a^2){}^{dz}/_{dt} = 0 \Rightarrow x(y^2-a^2).Vx + y(x^2-z^2).Vy - z(y^2-a^2).Vz = 0$

$s_2)$ $\Rightarrow x_2(y^2_2-a^2).Vx_2 + y_2(x^2_2-z^2_2).Vy_2 - z_2(y^2_2-a^2).Vz_2 = 0$

$$s_2/s_1) \Rightarrow \begin{cases} y'_{1,2} = \dfrac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \left\{ \dfrac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2} \right. \end{cases}$$

E

$$o'_{1,2}=\begin{cases}x_{1,2} = x_2 - x_1\\ y_{1,2} = y_2 - y_1\\ z_{1,2} = z_2 - z_1\end{cases}$$ F

$$o'_{1,2}=\begin{cases}m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1\\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1\\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1\end{cases}$$ G

$$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$$ H

Based on theprovidedsoftware E,F,G,H

5-1 $y.z(y+z).dx + x.z.(x+z).dy + x.y(x+y).dz = 0 \Rightarrow y.z(y+z).{}^{dx}/_{dt} + x.z.(x + z).{}^{dy}/_{dt} + x.y(x+y).{}^{dz}/_{dt} = 0 \Rightarrow y.z(y+z).Vx+x.z.(x+z).Vy + x.y(x+y).Vz =0$

s_1)$\Rightarrow y_1.z_1\ (y_1+z_1).Vx_1+x_1.z_1.(x_1+z_1).Vy_1 + x_1.y_1\ (x_1+y_1).Vz_1$

5-2 $z(z+y^2).dx +z(z+x^2).dy - x.y.(x +y).dz = 0 \Rightarrow z(z + y^2).{}^{dx}/_{dt} + z(z+x^2).{}^{dy}/_{dt} - x.y.(x+y).{}^{dz}/_{dt} = 0 \Rightarrow z(z+y^2).Vx+z(z+x^2).Vy - x.y.(x+y).Vz = 0$

s_2)$\Rightarrow z_2\ (z_2+y^2{}_2).Vx_2+z_2\ (z_2+x^2{}_2).Vy_2 - x_2.y_2.(x_2+y_2).Vz_2 = 0$

$$s_2/_{s_1})\Rightarrow\begin{cases}y'_{1,2} = \dfrac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2}\\[2ex] z'_{1,2} = \left\{\dfrac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2}\right.\end{cases}$$ E

$$o'_{1,2}=\begin{cases}x_{1,2} = x_2 - x_1\\ y_{1,2} = y_2 - y_1\\ z_{1,2} = z_2 - z_1\end{cases}$$ F

$$o'_{1,2}=\begin{cases}m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1\\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1\\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1\end{cases}$$ G

$$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$$ H

Based on theprovidedsoftware E,F,G,H

6-1 $(y+z).dx+(z+x).dy + (x+y).dz =0 \Rightarrow (y+z).{}^{dx}/_{dt}+(z+x).{}^{dy}/_{dt} +(x+y).{}^{dz}/_{dt} = 0\Rightarrow (y+z).Vx+ (z+x).Vy +(x+y).Vz = 0$

s_1)$\Rightarrow (y_1+z_1).Vx_1+ (z_1+x_1).Vy_1 +(x_1+y_1).Vz_1 = 0$

6-2 $z.y(a-x).dx +[z-y^2 + (a-x)^2].dy -y.dz =0 \Rightarrow z.y(a - x).{}^{dx}/_{dt} +[z-y^2 + (a-x)^2].{}^{dy}/_{dt} -y.{}^{dz}/_{dt} = 0\Rightarrow z.y(a-x).Vx +[z-y^2 + (a - x)^2].Vy - y.Vz =0$

s_2)$\Rightarrow z_2.y_2(a-x_2).Vx_2 +[z_2-y^2{}_2 + (a - x_2)^2].Vy_2 - y_2.Vz_2 =0$

$$s_2/_{s_1})\Rightarrow\begin{cases}y'_{1,2} = \dfrac{m_1.Vy_1-m_2.Vy_2}{m_1.Vx_1-m_2.Vx_2}\\[2ex] z'_{1,2} = \left\{\dfrac{m_1.Vz_1-m_2.Vz_2}{m_1.Vx_1-m_2.Vx_2}\right.\end{cases}$$ E

$$o'_{1,2}=\begin{cases}x_{1,2} = x_2 - x_1\\ y_{1,2} = y_2 - y_1\\ z_{1,2} = z_2 - z_1\end{cases}$$ F

$$o'_{1,2}=\begin{cases}m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1\\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1\\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1\end{cases}$$ G

H Based on theprovidedsoftware E,F,G,H

$$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$$

7-1 $y.(1+z^2).dx + x.(1+z^2).dy+(x^2+y^2).dz =0 \Rightarrow y.(1 + z^2).{}^{dx}/_{dt} + x.(1 + z^2).{}^{dy}/_{dt} + (x^2 + y^2).{}^{dz}/_{dt} = 0\Rightarrow$

$y.(1 + z^2).Vx+ x.(1 + z^2).Vy +(x^2 + y^2).Vz=0$

s_1)$\Rightarrow y_1.(1 + z^2{}_1).Vx_1+ x_1.(1 + z^2{}_1).Vy_1 +(x^2{}_1 + y^2{}_1).Vz_1=0$

7-2 $(y2 + y.z + z^2).dx +(z^2 + z.x + x^2).dy + (x^2 + x.y + y^2).dz = 0\Rightarrow (y2 + y.z + z^2).{}^{dx}/_{dt} + (z^2 + z.x + x^2).{}^{dy}/_{dt} + (x^2 + x.y + y^2).{}^{dz}/_{dt} = 0\Rightarrow(y2 + y.z + z^2).Vx + (z^2 + z.x + x^2).Vy + (x^2 + x.y + y^2).Vz = 0$

s_2)$\Rightarrow(y2_2 + y_2.z_2 + z^2{}_2).Vx_2 + (z^2{}_2 + z_2.x_2 + x^2{}_2).Vy_2 + (x^2 + x_2.y_2 + y^2{}_2).Vz_2 = 0$

$$\left.{}^{s_2}/_{s_1}\right)\Rightarrow\begin{cases} y'_{1,2} = \dfrac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \left\{\dfrac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2}\right. \end{cases}$$ E

$$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$$ F

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$$ G

$$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$$ H

Based on theprovidedsoftware E,F,G,H

8-1y.z.dx + x.z.dy + x.y. dz = 0 $\Rightarrow$y.z.${}^{dx}/_{dt}$ + x.z. ${}^{dy}/_{dt}$ + x.y.${}^{dz}/_{dt}$ = 0$\Rightarrow$y.z. Vx+ x.z. Vy + x.y.Vz = 0

s_1)$\Rightarrow$$y_1.z_1$. Vx_1+ $x_1.z_1$. Vy_1 + $x_1.y_1$. Vz_1 = 0

8-2 (1+y+z). dx+x.(z-x).dy-(1+x.y).dz=0$\Rightarrow$(1+y+z).${}^{dx}/_{dt}$+x.(z-x).${}^{dy}/_{dt}$ -(1+x.y).${}^{dz}/_{dt}$=0$\Rightarrow$(1+y+z).Vx+x.(z-x).Vy– (1+x.y).Vz =0

s_2)$\Rightarrow$(1+y_2+z_2).Vx_2+x_2.(z_2-x_2).Vy_2– (1+$x_2.y_2$).Vz_2 =0

$$\left.{}^{s_2}/_{s_1}\right)\Rightarrow\begin{cases} y'_{1,2} = \dfrac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \left\{\dfrac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2}\right. \end{cases}$$ E

$$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$$ F

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$$ G

Based on theprovidedsoftware E,F,G,H

H

$$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$$

9-1 y.(x + 4).(y + z).dx – x.(y + 3.z). dy + 2.x.y. dz = 0 $\Rightarrow$y.(x + 4).(y + z).${}^{dx}/_{dt}$ - x.(y + 3.z). ${}^{dy}/_{dt}$ + 2.x.y.${}^{dz}/_{dt}$ = 0$\Rightarrow$y.(x + 4).(y + z). Vx- x.(y + 3.z). Vy + 2.x.y. Vz = 0

s_1)$\Rightarrow$ y_1.(x_1 + 4).(y_1+z_1). Vx_1- x_1.(y_1 + 3.z_1). Vy_1 + 2.$x_1.y_1$. Vz_1 = 0

9-2 y.z.dx+(x^2 -y- z.x).dy+(x^2.z-x.y).dz = 0 $\Rightarrow$y.z. ${}^{dx}/_{dt}$ + (x^2. - y- z.x).${}^{dy}/_{dt}$ + (x^2.z- x.y).${}^{dz}/_{dt}$ = 0$\Rightarrow$y.z.Vx + (x^2. - y-z.x).Vy +(x^2.z- x.y).Vz=0

s_2)$\Rightarrow$ $y_2.z_2.Vx_2$ + ($x^2{}_2$- y_2- $z_2.x_2$).Vy_2 +($x^2{}_2.z_2$- $x_2.y_2$).Vz_2=0

$$\left.{}^{s_2}/_{s_1}\right)\Rightarrow\begin{cases} y'_{1,2} = \dfrac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \left\{\dfrac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2}\right. \end{cases}$$ E

$$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$$ F

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$$ G

$$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$$

H Based on theprovidedsoftware E,F,G,H

10-1 2.y.z. dx–2.x.z. dy-(x^2– y^2).(z-1). dz =0⇨2.y.z.$^{dx}/_{dt}$ - 2.x.z. $^{dy}/_{dt}$-(x^2– y^2).(z-1).$^{dz}/_{dt}$ = 0⇨2.y.z. Vx- 2.x.z.Vy -(x^2 – y^2).(z - 1).Vz= 0

s_1)⇨$2.y_1.z_1.\ Vx_1 - 2.x_1.z_1.Vy_1 - (x^2_1 - y^2_1).(z_1 - 1).Vz_1 = 0$

10-2 $\frac{dx}{y^3.x-2.x^4} = \frac{dy}{2.y^4-x^3.y} = \frac{dz}{2.z.(x^3-y^3)}$⇨$\frac{dx/dt}{y^3.x-2.x^4} = \frac{dy/dt}{2.y^4-x^3.y} = \frac{dz/dt}{2.z.(x^3-y^3)}$⇨$\frac{Vx}{y^3.x-2.x^4} = \frac{Vy}{2.y^4-x^3.y} = \frac{Vz}{2.z.(x^3-y^3)}$

s_2)⇨$\frac{Vx_2}{y^3{}_2.x_2-2.x^4{}_2} = \frac{Vy_2}{2.y^4{}_2-x^{3}{}_2.y_2} = \frac{Vz_2}{2.z_2.(x^3{}_2-y^3{}_2)}$

$s_2/_{s_1}$)⇨$\begin{cases} y'_{1,2} = \dfrac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \dfrac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2} \end{cases}$ E

$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$ F

$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$ G

$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$ H

11-1 $\frac{dx}{2.x.z} = \frac{dy}{2.y.z} = \frac{dz}{z^2-x^2-y^2}$⇨$\frac{dx/dt}{2.x.z} = \frac{dy/dt}{2.y.z} = \frac{dz/dt}{z^2-x^2-y^2}$⇨$\frac{Vx}{2.x.z} = \frac{Vy}{2.y.z} = \frac{Vz}{z^2-x^2-y^2}$

s_1)⇨$\frac{Vx_1}{2.x_1.z_1} = \frac{Vy_1}{2.y_1.z_1} = \frac{Vz_1}{z^2{}_1-x^2{}_1-y^2{}_1}$

11-2 $\frac{dx}{x+y} = \frac{dy}{x+y} = \frac{dz}{-(x+y+2.z)}$⇨$\frac{dx/dt}{x+y} = \frac{dy/dt}{x+y} = \frac{dz/dt}{-(x+y+2.z)}$⇨$\frac{Vx}{x+y} = \frac{Vy}{x+y} = \frac{Vz}{-(x+y+2.z)}$ E

s_2)⇨$\frac{Vx_2}{x_2+y_2} = \frac{Vy_2}{x_2+y_2} = \frac{Vz_2}{-(x_2+y_2+2.z_2)}$

$s_2/_{s_1}$)⇨$\begin{cases} y'_{1,2} = \dfrac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \dfrac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2} \end{cases}$ F

$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$

$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$ G

$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$

H Based on theprovidedsoftware E,F,G,H

12-1 $\frac{dx}{c.y-b.z} = \frac{dy}{a.z-c.x} = \frac{dz}{b.x-z.y}$⇨$\frac{dx/dt}{c.y-b.z} = \frac{dy/dt}{a.z-c.x} = \frac{dz/dt}{b.x-z.y}$⇨$\frac{Vx}{c.y-b.z} = \frac{Vy}{a.z-c.x} = \frac{Vz}{b.x-z.y}$

a = cte

S_1)⇨$\frac{Vx_1}{c.y_1-b.z_1} = \frac{Vy_1}{a.z_1-c.x_1} = \frac{Vz_1}{b.x_1-z_1.y_1}$

12-2 $\frac{dx}{x^2+a^2} = \frac{dy}{x.y-a.z} = \frac{dz}{x.z+a.y}$⇨$\frac{dx/dt}{x^2+a^2} = \frac{dy/dt}{x.y-a.z} = \frac{dz/dt}{x.z+a.y}$⇨$\frac{Vx}{x^2+a^2} = \frac{Vy}{x.y-a.z} = \frac{Vz}{x.z+a.y}$

S_2)⇨$\frac{Vx_2}{x^2{}_2+a^2} = \frac{Vy_2}{x_2.y_2-a.z_2} = \frac{Vz_2}{x_2.z_2+a.y_2}$

$s_2/_{s_1}$)⇨$\begin{cases} y'_{1,2} = \dfrac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \dfrac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2} \end{cases}$ E

$$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$$ F

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$$ G

$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$ H Based on theprovidedsoftware E,F,G,H

13-1z.y.dx –z.x. dy - y². dz = 0 ⇨z.y.$^{dx}/_{dt}$ – z.x. $^{dy}/_{dt}$ - y².$^{dz}/_{dt}$ = 0⇨z.y. Vx – z.x. Vy - y². Vz = 0

s_1)⇨$z_1.y_1$. Vx_1 – $z_1.x_1$. Vy_1 - y^2_1. Vz_1 = 0

13-2 (y² + z²). dx + x.y.dy + x.z.dz = 0⇨(y² + z²). $^{dx}/_{dt}$ + x.y.$^{dy}/_{dt}$ + x.z.$^{dz}/_{dt}$ = 0⇨(y² + z²). Vx + x.y.Vy + x.z. Vz = 0

s_2)⇨(y^2_2 + z^2_2). Vx_2 + $x_2.y_2.Vy_2$ + $x_2.z_2$. Vz_2 = 0

$$^{s_2}/_{s_1})⇨ \begin{cases} y'_{1,2} = \dfrac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \dfrac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2} \end{cases}$$ E

$$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$$ F

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$$ G

$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$ H Based on theprovidedsoftware E,F,G,H

14-1 (y + z).dx + dy + dz = 0 ⇨(y +z).$^{dx}/_{dt}$ + $^{dy}/_{dt}$ +$^{dz}/_{dt}$ = 0⇨(y + z). Vx + Vy + Vz = 0

s_1)⇨(y_1 + z_1). Vx_1 + Vy_1 + Vz_1 = 0

14-2 (2.x.y.z +z²).dx + x².z.dy +(x.z+1).dz =0⇨(2.x.y.z + z²).$^{dx}/_{dt}$ + x².z.$^{dy}/_{dt}$ + (x.z + 1).$^{dz}/_{dt}$ = 0⇨ (2.x.y.z + z²). Vx + x².z.Vy + (x.z + 1). Vz = 0

s_2)⇨ (2.$x_2.y_2.z_2$ + z^2_2). Vx_2 + $x^2_2.z_2.Vy_2$ + ($x_2.z_2$ + 1). Vz_2 = 0

$$^{s_2}/_{s_1})⇨ \begin{cases} y'_{1,2} = \dfrac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \dfrac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2} \end{cases}$$ E

$$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$$ F

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$$ G

$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$

H Based on theprovidedsoftware E,F,G,H

15-1z.y².dx + z.x².dy - x²y².dz = 0⇨ z.y².$^{dx}/_{dt}$+ z.x².$^{dy}/_{dt}$ - x²y². $^{dz}/_{dt}$ = 0⇨z.y².Vx + z.x².Vy-x²y².Vz = 0

s_1)⇨$z_1.y^2_1.Vx_1$+$z_1.x^2_1.Vy_1$-$x^2_1y^2_1.Vz_1$ = 0

15-2 x.(y² - z²).dx + y²(z² - x²).dy + z.(x²-y²).dz = 0⇨x.(y² - z²).$^{dx}/_{dt}$ + y²(z² - x²).$^{dy}/_{dt}$ + z.(x² - y²).$^{dz}/_{dt}$ = 0⇨

x.(y² - z²).Vx+y²(z²-x²).Vy + z.(x² - y²).Vz =0

s_2)⇨x_2.(y^2_2 - z^2_2).Vx_2+y^2_2 (z^2_2-x^2_2).Vy_2 + z_2.(x^2_2 - y^2_2).Vz_2 =0

$$^{s_2}/_{s_1})⇨\begin{cases} y'_{1,2} = \frac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \left\{\frac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2}\right. \end{cases}$$ E

$$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$$ F

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$$ G

$$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$$ H Based on theprovidedsoftware E,F,G,H

16-1 $(y^2-z^2).dx+(x^2-z^2).dy+(x+y).(x+y+2.z).dz = 0 ⇨ (y^2-z^2).^{dx}/_{dt}+(x^2-z^2).^{dy}/_{dt}+(x+y).(x+y+2.z).^{dz}/_{dt}=0⇨$

$(y^2-z^2).Vx + (x^2-z^2).Vy+(x+y).(x+y+2.z).Vz = 0$

$s_1)⇨(y^2_1-z^2_1).Vx_1 + (x^2_1-z^2_1).Vy_1+(x_1+y_1).(x_1+y_1+2.z_1).Vz_1 = 0$

16-2 $(y^2+y.z).dx+(x.z+z^2).dy+(y^2-x.y).dz=0⇨(y^2+y.z).^{dx}/_{dt}+(x.z+z^2).^{dy}/_{dt}+(y^2-x.y).^{dz}/_{dt}=0⇨(y^2+y.z).Vx+(x.z+z^2).Vy+(y^2-x.y).vz=0$

$s_2)⇨(y^2_2+y_2.z_2).Vx_2+(x_2.z_2+z^2_2).Vy_2+(y^2-x_2.y_2).Vz_2=0$

$$^{s_2}/_{s_1})⇨\begin{cases} y'_{1,2} = \frac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \left\{\frac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2}\right. \end{cases}$$ E

F

$$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$$

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$$ G

$$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$$ H Based on theprovidedsoftware E,F,G,H

17-1 $2.z.(y + z).dx - 2.x.z.dy - [(y + z)^2-x^2 -2.x.z]. dz = 0⇨2.z.(y + z).^{dx}/_{dt} -2.x.z.^{dy}/_{dt} - [(y + z)^2-x^2 -2.x.z].^{dz}/_{dt} = 0⇨$

$2.z.(y + z).Vx - 2.x.z. Vy - [(y + z)^2-x^2 -2.x.z]. Vz = 0$

$s_1)⇨2.z_1.(y_1+ z_1).Vx_1 - 2.x_1.z_1. Vy_1 - [(y_1 + z_1)^2-x^2_1 -2.x_1.z_1]. Vz_1 = 0$

17-2 $(x^2 + x.y+y.z).dx-x.(x+ z).dy+ x^2.dz =0 ⇨(x^2 + x.y + y.z).^{dx}/_{dt} - x.(x + z).^{dy}/_{dt} + x^2.^{dz}/_{dt} = 0⇨$

$(x^2 + x.y + y.z).Vx - x.(x + z).Vy + x^2. Vz = 0$

$s_2)⇨(x^2_2 + x_2.y_2 + y_2.z_2).Vx_2 - x_2.(x_2 + z_2).Vy_2 + x^2_2. Vz_2 = 0$

$$^{s_2}/_{s_1})⇨\begin{cases} y'_{1,2} = \frac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \left\{\frac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2}\right. \end{cases}$$ E

$$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$$ F

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$$ G

$$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$$ H Based on theprovidedsoftware E,F,G,H

18-1 $y.z(1+4.x.z).dx+x.z.(1+2.x.z).dy+x.y.dz=0 ⇨y.z(1+4.x.z).^{dx}/_{dt} + x.z.(1+2.x.z).^{dy}/_{dt} + x.y.^{dz}/_{dt} = 0⇨y.z(1+4.x.z).Vx+x.z.(1+2.x.z).Vy+ x.y.Vz = 0$

$s_1) \Rightarrow y_1.z_1\,(1+4.x_1.z_1).Vx_1+x_1.z_1.(1+2.x_1.z_1).Vy_1+x_1.y_1.Vz_1 = 0$

18-2 $(2.x.z+z^2).dx+2.y.z.dy-(2.x^2+2.y^2+x.z-z.a^2).dz = 0 \Rightarrow (2.x.z+z^2).{}^{dx}/_{dt}+2.y.z.{}^{dy}/_{dt}+(2.x^2+2.y^2+x.z-z.a^2).{}^{dz}/_{dt}$ $=0 \Rightarrow (2.x.z+z^2).Vx + 2.y.z.Vy - (2.x^2+2.y^2+x.z-z.a^2).\ Vz = 0$

$s_2) \Rightarrow (2.x_2.z_2+z^2{}_2).Vx_2 + 2.y_2.z_2.Vy_2 - (2.x^2{}_2+2.y^2{}_2+x_2.z_2 - z_2.a^2).\ Vz_2 = 0$

$$^{s_2}/_{s_1}) \Rightarrow \begin{cases} y'_{1,2} = \frac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \left\{\frac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2}\right. \end{cases} \quad \text{E}$$

$$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases} \quad \text{F}$$

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases} \quad \text{G}$$

$$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2} \quad \text{H}$$

Based on theprovidedsoftware E,F,G,H

19-1 $(y.dx + x.dy).(a - z)+x.y.\ dz = 0 \Rightarrow (y.{}^{dx}/_{dt} + x.{}^{dy}/_{dt}).(a - z) + x.y.\ {}^{dz}/_{dt} = 0 \Rightarrow (y.Vx + x.Vy).(a - z)+ x.y.\ Vz = 0$

$s_1) \Rightarrow (y_1.Vx_1 + x_1.Vy_1).(a - z_1)+ x_1.y_1.\ Vz_1 = 0$

19-2 $2.x.dx+(2.x^2.z+2.y.z+2.y^2+1).dy+dz = 0 \Rightarrow 2.x.{}^{dx}/_{dt}+(2.x^2.z+2.y.z+2.y^2+1).{}^{dy}/_{dt}+{}^{dz}/_{dt}=0 \Rightarrow$

$2.x.Vx+(2.x^2.z+2.y.z+2.y^2+1).Vy + Vz = 0$

$s_2) \Rightarrow 2.x_2.Vx_2 + (2.x^2{}_2.z_2 + 2.y_2.z_2 + 2.y^2{}_2+1).Vy_2 + Vz_2 = 0$

$$^{s_2}/_{s_1}) \Rightarrow \begin{cases} y'_{1,2} = \frac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \left\{\frac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2}\right. \end{cases} \quad \text{E}$$

$$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases} \quad \text{F}$$

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases} \quad \text{G}$$

$$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2} \quad \text{H}$$

Based on theprovidedsoftware E,F,G,H

20-1 $2.x.z.(y - z).\ dx - z.(x^2+2.z).dy + y.(x^2+z.y).\ dz = 0 \Rightarrow 2.x.z.(y - z).{}^{dx}/_{dt} - z.(x^2+2.z).{}^{dy}/_{dt} + y.(x^2 + z.y).\ {}^{dz}/_{dt} = 0 \Rightarrow$

$2.x.z.(y - z).Vx - z.(x^2+2.z).\ Vy + y.(x^2 + z.y).\ Vz = 0$

$s_1) \Rightarrow 2.x_1.z_1.(y_1 - z_1).Vx_1 - z_1.(x^2{}_1+2.z_1).\ Vy_1 + y_1.(x^2{}_1+ z_1.y_1).\ Vz_1 = 0$

20-2 $(12.x+29.y).z.dx-(11.x+12.y).z.dy-(2.x^2+3.x.y-z.y^2).dz=0 \Rightarrow (12.x+29.y).z.{}^{dx}/_{dt}-(11.x+12.y).z.{}^{dy}/_{dt}-(2.x^2+3.x.y-z.y^2).\ {}^{dz}/_{dt} = 0 \Rightarrow (12.x + 29.y).z.Vx - (11.x + 12.y).z.\ Vy - (2.x^2 + 3.x.y - z.y^2).\ Vz = 0$

$s_2) \Rightarrow (12.x_2 + 29.y_2).z_2.Vx_2 - (11.x_2 + 12.y_2).z_2.\ Vy_2 - (2.x^2{}_2 + 3.x_2.y_2 - z_2.y^2{}_2).\ Vz_2 = 0$

$$^{s_2}/_{s_1}) \Rightarrow \begin{cases} y'_{1,2} = \frac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \left\{\frac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2}\right. \end{cases} \quad \text{E}$$

$$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases} \quad \text{F}$$

$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$ G

$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$ H Based on theprovidedsoftware E,F,G,H

21-1 $y.dx - x.dy + dz = 0 \Rightarrow y.{}^{dx}/_{dt} - x.{}^{dy}/_{dt} + {}^{dz}/_{dt} = 0 \Rightarrow y.Vx - x.Vy + Vz = 0$

$s_1) \Rightarrow y_1.Vx_1 - x_1.Vy_1 + Vz_1 = 0$

21-2 $\frac{dx}{y-z} = \frac{dy}{z-x} = \frac{dz}{x-y} \Rightarrow \frac{{}^{dx}/_{dt}}{y-z} = \frac{{}^{dy}/_{dt}}{z-x} = \frac{{}^{dz}/_{dt}}{z-y} \Rightarrow \frac{Vx}{y-z} = \frac{Vy}{z-x} = \frac{Vz}{x-y}$

$s_2) \Rightarrow \frac{Vx_2}{y_2-z_2} = \frac{Vy_2}{z_2-x_2} = \frac{Vz_2}{x_2-y_2}$

${}^{s_2}/_{s_1}) \Rightarrow \begin{cases} y'_{1,2} = \frac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \frac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2} \end{cases}$ E

$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$ F

$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$ G

$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$

H Based on theprovidedsoftware E,F,G,H

22-1 $dx + dy + dz = 0 \frac{dx}{dt} + \frac{dy}{dt} + \frac{dy}{dt} = 0 \Rightarrow Vx + Vy + Vz = 0$

$s_1) \Rightarrow Vx_1 + Vy_1 + Vz_1 = 0$

22-2 $x.dx + y.dy + z.dz = 0 \Rightarrow z.{}^{dx}/_{dt} + y.{}^{dy}/_{dt} + z.{}^{dz}/_{dt} = 0 \Rightarrow x.Vx + y.Vy + z.Vz = 0$

$s_2) \Rightarrow x_2.Vx_2 + y_2.Vy_2 + z_2.Vz_2 = 0$

${}^{s_2}/_{s_1}) \Rightarrow \begin{cases} y'_{1,2} = \frac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \frac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2} \end{cases}$ E

$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$ F

$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$ G

H Based on theprovidedsoftware E,F,G,H

$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$

23-1 $(x - .a)^2 + (y - b)^2 + z^2 = 1 \Rightarrow 2.(x - a).dx + 2.(y - b).dy + 2.z.dz = 0 \Rightarrow 2.(x-a).{}^{dx}/_{dt} + 2.(y - b).{}^{dy}/_{dt} + 2.z.{}^{dz}/_{dt} = 0 \Rightarrow 2.(x - a).Vx + 2.(y - b).Vy + 2.z.Vz = 0$

V_T=?
a = cte
b = cte

$s_1) \Rightarrow 2.(x_1 - a).Vx_1 + 2.(y_1 - b).Vy_1 + 2.z_1.Vz_1 = 0$

23-2 $Z = (x + a).(y + b) = x.y + b.x + a.y + a.b \Rightarrow dz = x.dy + y.dx + b.dx + a.dy + 0 = (x + a).dy + y.dx + b.dx$

${}^{dz}/_{dt} = (x + a).{}^{dy}/_{dt} + (y + b).{}^{dx}/_{dt} \Rightarrow Vz = (x + a).Vy + (y + b).Vx$

V_T=?
a = cte
b = cte

$s_2) \Rightarrow Vz_2 = (x_2 + a).Vy_2 + (y_2 + b).Vx_2$

$$s_2/s_1) \Rightarrow \begin{cases} y'_{1,2} = \frac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \frac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2} \end{cases} \quad E$$

$$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases} \quad F$$

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases} \quad G$$

$$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2} \quad H$$

Based on theprovidedsoftware E,F,G,H

V_T=?
a = cte
b = cte

24-12.z.=(ax + y)²+b⇨2.z =(a².x² + y² + 2.a.x.y)+b⇨2.dz = 2.a².x.dx + 2.y.dy + 2.a.x.dy + 2.a.y.dx

2.dz = (2.a².x + 2.a.y).dx + (2.y + 2.a.x).dy⇨2.$^{dz}/_{dt}$=(2.a².x + 2.a.y).$^{dx}/_{dt}$ + (2.y + 2.a.x). $^{dy}/_{dt}$⇨

2. Vz = (2.a².x + 2.a.y). Vx + (2.y + 2.a.x). Vy

s_1)⇨2. Vz_1 = (2.a².x_1 + 2.a.y_1). Vx_1 + (2.y_1 + 2.a.x_1). Vy_1

V_T=?
a = cte
b = cte

24-2a.x² + b.y² + z² = 1⇨2.a.x.dx + 2.b.y.dy + 2.z.dz = 0⇨2.a.x.$^{dx}/_{dt}$ + 2.b.y.$^{dy}/_{dt}$ + 2.z.$^{dz}/_{dt}$ = 0⇨

2.a.x.Vx + 2.b.y.Vy + 2.z.Vz = 0

s_2)⇨2.a.x_2.Vx_2 + 2.b.y_2.Vy_2 + 2.z_2.Vz_2 = 0

$$s_2/s_1) \Rightarrow \begin{cases} y'_{1,2} = \frac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \frac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2} \end{cases} \quad E$$

$$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases} \quad F$$

$$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases} \quad G$$

$$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2} \quad H$$

Based on theprovidedsoftware E,F,G,H

25-1 x² + y² + z² = C⇨2.x.dx + 2.y.dy + 2.z.dz = 0 ⇨2.x. $^{dx}/_{dt}$ + 2.y.$^{dy}/_{dt}$ +2.z. $^{dz}/_{dt}$ = 0⇨2.x.Vx + 2.y.Vy + 2.z.Vz = 0

V_T=?
c = cte

s_1)⇨2.x_1.Vx_1 + 2. y_1.Vy_1 + 2.z_1.Vz_1 = 0

25-2 x.(y² + z)- y.(x² + z) = (x² - y²)z⇨x.y² + x.z – y.x² - y.z = x².z - y².z⇨2.x.y.dy + y².dx + x.dz + z.dx – 2.y.x.dx - x².dy-y.dz – z.dy = 2.x.z.dx + x².dz – 2.y.z.dy - y².dz⇨ (2.x.y – x² – z + 2.y.z).dy + (y² + z – 2.y.x – 2.x.z).dx + (x – y - x² + y²).dz = 0⇨ (2.x.y – x² – z + 2.y.z).$^{dy}/_{dt}$+ (y² + z – 2.y.x – 2.x.z).$^{dx}/_{dt}$+ (x – y - x² + y²).$^{dz}/_{dt}$= 0⇨

s_2)⇨(2.x_2.y_2 – x^2_2 – z_2 + 2.y_2.z_2).Vy_2 + (y^2_2 + z_2 – 2.y_2.x_2 – 2.x_2.z_2).Vx_2 + (x_2 – y_2 - x^2_2 + y^2_2).Vz_2 = 0

$$s_2/s_1) \Rightarrow \begin{cases} y'_{1,2} = \frac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \frac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2} \end{cases} \quad E$$

$$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases} \quad F$$

o'$_{1,2}$ = $\begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$ G

$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$ H Based on theprovidedsoftware E,F,G,H

V_T=?
c = cte

26-1x² + y² - 2.z = C⇨2.x.dx + 2.y.dy - 2.dz = 0 ⇨2.x. $^{dx}/_{dt}$ + 2.y.$^{dy}/_{dt}$ -2.$^{dz}/_{dt}$ = 0⇨

s$_1$)⇨2.x$_1$.Vx$_1$ + 2.y$_1$.Vy$_1$ - 2.Vz$_1$ = 0

26-2x²+y²+2.x.y.z –2.z+2= 0⇨2.x.dx+2.y.dy+2.y.z.dx+2.x.y.dz+2.x.z.dy–2.dz = 0⇨(2.x+2.y.z).dx+(2.y+2.x.z).dy+(2.x.y - 2).dz =0⇨(2.x+2.y.z).$^{dx}/_{dt}$+ (2.y+2.x.z).$^{dy}/_{dt}$+ (2.x.y - 2).$^{dz}/_{dt}$= 0⇨(2.x+2.y.z).Vx+(2.y + 2.x.z).Vy + (2.x.y - 2).Vz = 0

s$_2$)⇨(2.x$_2$ + 2. y$_2$.z$_2$).Vx$_2$ + (2.y$_2$ + 2.x$_2$.z$_2$).Vy$_2$ + (2.x$_2$.y$_2$ - 2).Vz$_2$ = 0

$^{s_2}/_{s_1}$)⇨ $\begin{cases} y'_{1,2} = \frac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \left\{\frac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2}\right. \end{cases}$ E

o'$_{1,2}$ = $\begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$ F

o'$_{1,2}$ = $\begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$ G

H Based on theprovidedsoftware E,F,G,H

$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$

27-1 2.y.(z–3)+(2.x–z)= y.(2.x–3) ⇨2.y.z – 6.y+2.x–z =2.y.x–3y⇨2.y.dz + 2.z.dy -6.dy + 2.dx – dz = 2.y.dx + 2.x.dy – 3dy ⇨ (2.y – 1).dz + (2.z.dy -6-2.x + 3).dy + (2 – 2.y).dx = 0⇨ (2.y – 1).$^{dz}/_{dt}$+ (2.z.dy -6-2.x + 3).$^{dy}/_{dt}$+ (2–2.y).$^{dz}/_{dt}$=0⇨(2.y – 1).Vz + (2.z.dy -6-2.x + 3).Vy + (2 – 2.y).Vx = 0

s$_1$)⇨(2.y$_1$ – 1).Vz$_1$ + (2.z$_1$.dy$_1$ -6-2.x$_1$ + 3).Vy$_1$ + (2 – 2.y$_1$).Vx$_1$ = 0

27-2 (2.x.y–1)+(z–2.x²)=2(x–yz)⇨2.x.dy+2.y.dx+dz–4.x.dx=2.dx–2.y.dz–2.z.dy⇨ (2.x+2.z).dy+(2.y-4.x-2).dx+(1+2.y).dz = 0⇨ (2.x + 2.z).$^{dy}/_{dt}$+ (2.y - 4.x - 2).$^{dx}/_{dt}$+ (1 + 2.y).$^{dz}/_{dt}$= 0⇨ (2.x + 2.z).Vy + (2.y - 4.x - 2).Vx + (1 + 2.y).Vz = 0

s$_2$)⇨(2.x$_2$ + 2.z$_2$).Vy$_2$ + (2.y$_2$ - 4.x$_2$ - 2).Vx$_2$ + (1 + 2.y$_2$).Vz$_2$ = 0

$^{s_2}/_{s_1}$)⇨ $\begin{cases} y'_{1,2} = \frac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ z'_{1,2} = \left\{\frac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2}\right. \end{cases}$ E

o'$_{1,2}$ = $\begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$ F

o'$_{1,2}$ = $\begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$ G

$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$

H Based on theprovidedsoftware E,F,G,H

28-1 $\frac{dx}{x.(y^2+z)} = \frac{dy}{-y.(x^2+z)} = \frac{dz}{(x^2-y^2).z}$⇨$\frac{dx/dt}{x.(y^2+z)} = \frac{dx/dt}{-y.(x^2+z)} = \frac{dx/dt}{(x^2-y^2).z}$⇨$\frac{Vx}{x.(y^2+z)} = \frac{Vy}{-y.(x^2+z)} = \frac{Vz}{(x^2-y^2).z}$

s$_1$)⇨$\frac{Vx_1}{x_1.(y^2{}_1+z_1)} = \frac{Vy_1}{-y_1.(x^2{}_1+z_1)} = \frac{Vz_1}{(x^2{}_1-y^2{}_1).z_1}$

28-2 $^{dx}/_{dt} = Vx = 2.z - 4.x$⇨$^{dy}/_{dt} = Vy = 2.z - 2.y$⇨$^{dx}/_{dt} = Vz = 2.x - 2.y - 3.z$

$s_2)$⇨$\begin{cases} Vx_2 \\ Vy_2 \\ Vz_2 \end{cases}$

$^{s_2}/_{s_1})$⇨$\begin{cases} y'_{1,2} = \frac{m_1.Vy_1 - m_2.Vy_2}{m_1.Vx_1 - m_2.Vx_2} \\ \\ z'_{1,2} = \left\{\frac{m_1.Vz_1 - m_2.Vz_2}{m_1.Vx_1 - m_2.Vx_2}\right. \end{cases}$ E

$o'_{1,2} = \begin{cases} x_{1,2} = x_2 - x_1 \\ y_{1,2} = y_2 - y_1 \\ z_{1,2} = z_2 - z_1 \end{cases}$ F

$o'_{1,2} = \begin{cases} m_{1,2}.Vx_{1,2} = m_2.Vx_2 - m_1Vx_1 \\ m_{1,2}.Vy_{1,2} = m_2.Vy_2 - m_1Vy_1 \\ m_{1,2}.Vz_{1,2} = m_2.Vz_2 - m_1Vz_1 \end{cases}$ G

$m_{1,2}.V_{1,2} = \sqrt{(m_2.Vx_2 - m_1.Vx_1)^2 + (m_2.Vy_2 - m_1.Vy_1)^2 + (m_2.Vz_2 - m_1.Vz_1)^2}$

H Based on theprovidedsoftware E,F,G,H