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(1) $r = xi + yj + zk.$

$[t]^2 i + [-5t^2 + t]j + [t + 7]k.$

$\frac{dr}{dt} = (2t)i + [-10t + 1] + [1]k$

$\frac{d^2r}{dt^2} = 2i - 10j$ //.

(2) $P = i - 9j - 4k$ $Q = 8i - 3j + 6k$ $R = i - 4j - 3k$

$(P \times Q) \cdot (R \times P)$

$(P \times Q) = \begin{vmatrix} i & -9 & -4 \\ 8 & -3 & +6 \end{vmatrix}$

$i[-9 \times +6 - (-4 \times -3)] - j[(1 \times 6) - (-4 \times 8)] +$

$+k[(1 \times -3) - (-9 \times 8)].$

$[-54 - (+12)] - j[6 - [-32]] + k[-3 - [-72]]$

$-66i - 38j + 69k.$

$(P \times P) = \begin{bmatrix} i & j & k \\ 1 & -9 & -4 \\ 1 & -4 & -3 \end{bmatrix}$

$j(1 \times -3) - (1 \times -4)$.

$i[(-9 \times -3) - (~~+16~~)] = [(-4 \times -4) - (~~-1 \times -3~~)] + k[1 \times -4] [1 \times -9]$

$i[27 - (+16)] + [-3 - (-4)]j + k[-4 - (-9)]$

$i[11]i - [1]j + k[~~+5~~ 4]$

$11i - j - 5k$

$(P \times Q) \cdot (P \times R) = -66i - 38j + 69k \cdot 11i - j - 5k$

(3) $= -726i + 38j - 345k$

$r = 5\cos 7t\,i - 2e^{3t} j - 4t^3 k$

$\int 5(1/7)\sin 7t - 2(1/3)e^{3x} \frac{4t^{3+1}}{4}$

$\frac{5}{7}\sin 7t - \frac{2e^{3t}}{3} - \frac{4t^4}{4}$ //