Subject: Problem Set 3

Year. Month. Date. ( )

1E-3 (c) $x(t) = 1 + at$

$y(t) = 1 + bt$

$z(t) = 1 + ct$

where $a + 2b - c = 0$

1E-4 $r(t) = 0 + 2t\,i + (+(-1)t\,j + 2 + 1t\,K$

$2t^3 + 2 - t^2 - 2 - t^6 = 34$

$t = 32$

1I-3 (a) $x = 2\cos^2 t$ $x + y = 2$

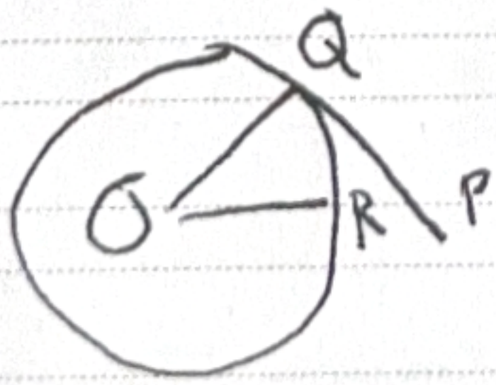
$y = \sin^2 t$

(b) $x = \cos 2t = \cos^2 t - \sin^2 t = 2\cos^2 - 1$

$y = \cos t$

$x = 2y^2 - 1$

1J-5 $OP = OQ + QP$



$OQ = a(\cos\theta\, i + \sin\theta\, j)$

$QP = a\theta(\sin\theta\, i - \cos\theta\, j)$

Subject:

Year. Month. Date. ( )

1ƒ-2

$$v = \int \frac{1}{-1+t^2} i + \frac{t}{1+t^2} j \, dt = \frac{-2t i + (1-t^2) j}{(1+t^2)^2}$$

$$|v| = \frac{1}{1+t^2}$$

$$T = \frac{-2t i + (1-t^2) j}{1+t^2}$$

1ƒ-4

(a) $x_{(t)}^2 + y_{(t)}^2 + z_{(t)}^2 = a^2$

$\Leftrightarrow \quad 2xx' + 2yy' + 2zz' = 0$

$\Leftrightarrow \quad \langle x, y, z \rangle \cdot \langle x', y', z' \rangle = 0$

$\Leftrightarrow \quad r \cdot r' = 0$

(b) ~~[illegible]~~

$|r| = a \Rightarrow r \cdot r = a^2 \Rightarrow 2r \cdot \frac{dr}{dt} = 0 \Rightarrow r \cdot v = 0$

(c)

$r \cdot v = 0 \Rightarrow r' \cdot r = 0 \Rightarrow r \cdot r = c \Rightarrow |r| = \sqrt{c}$

Subject:
Year. Month. Date. ( )

1ナ-6

(a) $\frac{d}{dt} a\cos t\,i + a\sin t\,j + bt\,k$

$= -a\sin t\,i + a\cos t\,j + b\,k = V$

$|V| = \sqrt{a^2+b^2}$

$T = \frac{V}{\sqrt{a^2+b^2}}$ $\quad a = -a(\cos t\,i + \sin t\,j)$

(b) $a^2\cos t\sin t - a^2\cos t\sin t = 0$

1ナ-9

a) $9\cos^2 t + 25\sin^2 t + 16\cos^2 t$

$= 25 \rightarrow a = 5$

b) $v = -3(5\sin t\,i + 5\cos t\,j) - 4\sin t\,k$

$\rightarrow |V| = 25$

c) $a = \frac{dv}{dt} = -3(\cos t\,i - 5\sin t\,j) - 4\cos t\,k = -r$

d) the Plane $4x - 3z = 0$

e) circle

Subject:
Year. Month. Date. ( )

1 K-3

$r \times a = 0$

$\Leftrightarrow r \times a + V \times V = 0$

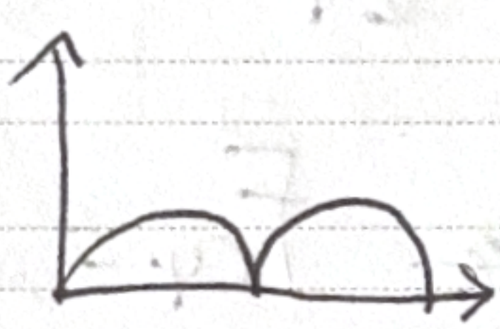
$\Leftrightarrow \frac{d}{dt}(r \times v) = 0$

$\Leftrightarrow |r \times v| = C$

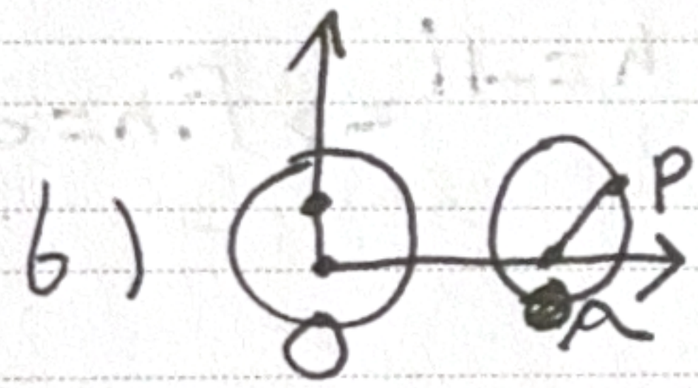
Part II

problem 1

a)



b)



$OP = OQ + QP + \langle 0,2 \rangle$

$= a\theta i + \sin(\frac{\pi}{2} - \theta) a j$

$+ \cos(\frac{\pi}{2} - \theta) a j + \langle 0,2 \rangle$

$= a\theta i + a \sin\theta i + a \cos\theta j$

$r = \langle t - \sin(t/2), 2 - \cos(t/2) \rangle + \langle 0,2 \rangle$

Subject:
Year. Month. Date. ( )

Problem 2

(a) $r(t)$ is in u, v - Plane

and $|r(t)|^2 = 1$

(b) $u = \frac{1}{\sqrt{3}} \langle 1, -1, 1 \rangle$

$v = h \times u = \langle 1, -4, 1 \rangle \times \langle 1, 2, 1 \rangle = 3\langle -1, 0, 1 \rangle$

$\rightarrow x = \frac{1}{\sqrt{3}} \cos t - \frac{1}{\sqrt{2}} \sin t, \; y = -\frac{1}{\sqrt{3}} \cos(t)$

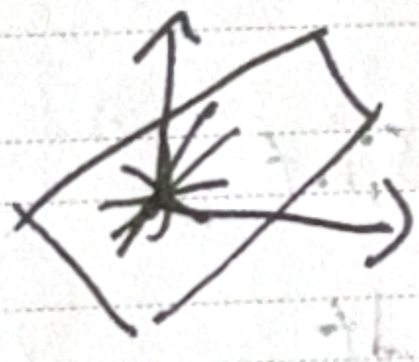
$z = \frac{1}{\sqrt{3}} \cos(t) + \frac{1}{\sqrt{2}} \sin(t)$

Problem 3

(a) $x = at$

$y = bt$

$z = (-a - 2b)t$

(b) 

Problem 4

a)

$Lt: R_t(u) = \langle 0, 0, 4 \rangle$

$+ u\langle \cos t, \sin t, -2 \rangle$