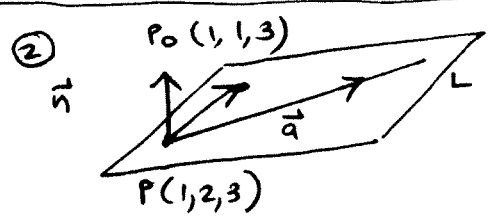


① a)  $f(x) = (x+1)^{1/2}$   $f'''(x) = \frac{3}{8}(x+1)^{-5/2}$   
 $f'(x) = \frac{1}{2}(x+1)^{-1/2}$   $f'''(0) = \frac{3}{8}$   
 $f''(x) = -\frac{1}{4}(x+1)^{-3/2}$   $f'''(0) = \frac{3}{8} = \frac{1}{16}$

b)  $\sin x = x - \frac{x^3}{3!} + \dots$   $(\sin x)(\cos x) = (x - \frac{x^3}{6} + \dots)(1 - \frac{x^2}{2} + \dots)$   
 $\cos x = 1 - \frac{x^2}{2!} + \dots$   
 $= x + (-\frac{1}{2} - \frac{1}{6})x^3 + \dots = x - \frac{2}{3}x^3 + \dots$

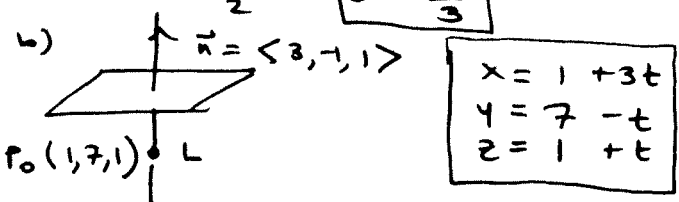
c)  $\frac{x}{1+x^3}$ ;  $\frac{1}{1-x} = 1+x+x^2+\dots$   
 $\frac{1}{1+x^3} = 1-x^3+x^6-\dots$   $\rightarrow \frac{x}{1+x^3} = x - x^4 + x^7 - \dots$



$L: \begin{cases} x=1-t \\ y=2+t \\ z=3-t \end{cases}$   
 $\vec{a} = \langle -1, 1, -1 \rangle$   
 $\vec{PP}_0 = \langle 0, -1, 0 \rangle$   
 $\vec{n} = \vec{a} \times \vec{PP}_0 = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -1 & 1 & -1 \\ 0 & -1 & 0 \end{vmatrix}$   
 $\vec{n} = \langle -1, 0, 1 \rangle$

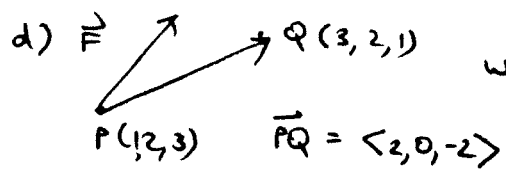
$\Rightarrow -1(x-1) + (z-3) = 0 \Rightarrow z - x = 2$

③ a)  $\vec{a} \cdot \vec{b} = \langle 0, 1, 1 \rangle \cdot \langle -1, 0, 1 \rangle = 1 = |\vec{a}||\vec{b}| \cos \theta = \sqrt{2}\sqrt{2} \cos \theta$   
 $\Rightarrow \cos \theta = \frac{1}{2} \Rightarrow \theta = \frac{\pi}{3}$

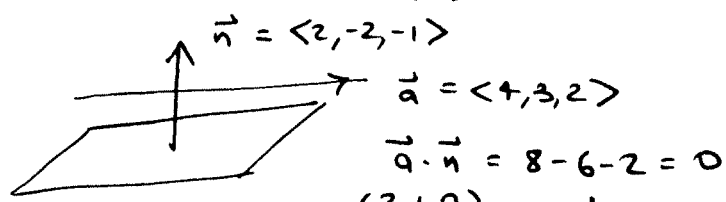


$\vec{n} = \langle 3, -1, 1 \rangle$   
 $\begin{cases} x = 1 + 3t \\ y = 7 - t \\ z = 1 + t \end{cases}$

c)  $f(x) = \sqrt{x} \Rightarrow f(4) = 2$   
 $f'(x) = \frac{1}{2}x^{-1/2} \Rightarrow f'(4) = \frac{1}{2 \cdot 2} = \frac{1}{4}$   
 $T_1(x) = 2 + \frac{1}{4}(x-4)$



$w = \vec{F} \cdot \vec{PQ} = \langle 2, 2, 1 \rangle \cdot \langle 2, 0, -2 \rangle = 4 - 2 = 2$



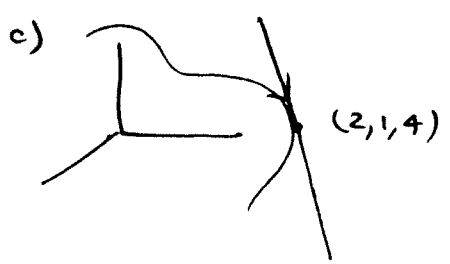
e)  $L: \frac{x-2}{4} = \frac{y-1}{3} = \frac{z}{2}$   
 $P: 2x - 2y - z = 2$

TRUE

$\vec{a} = \langle 4, 3, 2 \rangle$   
 $\vec{a} \cdot \vec{n} = 8 - 6 - 2 = 0$   
 $(2, 1, 0)$  on  $L$   
 $2(2) - 2(1) = 2 \Rightarrow 4 - 2 = 2 \checkmark$

④  $\vec{r}(t) = \langle t^2+1, t, 4\sqrt{t} \rangle$  a)  $\vec{r}'(t) = \langle 2t, 1, \frac{2}{\sqrt{t}} \rangle$

b)  $(2, 1, 4) : t=1 \Rightarrow \begin{cases} 1^2+1=2 \checkmark \\ 4\sqrt{1}=4 \end{cases}$



c)  $\vec{r}'(1) = \langle 2, 1, 2 \rangle$   
 $\begin{cases} x = 2 + 2\tau \\ y = 1 + \tau \\ z = 4 + 2\tau \end{cases}$