S' 13.4 #5

$\bar{r} = \langle 3\cos t, 2\sin t \rangle$ Find $\bar{v}, v, \bar{a}$

$\bar{v} = \bar{r}' = \langle -3\sin t, 2\cos t \rangle$

$\bar{a} = \bar{v}' = \langle -3\cos t, -2\sin t \rangle$

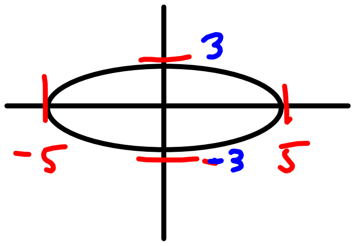
$v = |\bar{v}| = \sqrt{9\sin^2 t + 4\cos^2 t}$ Book got cute

$= \sqrt{5\sin^2 t + 4}$ Meh.

$\bar{r}(t) = \langle 5\sin(t), 3\cos(t), 4\cos(t) \rangle$, for $0 \le t \le 2\pi$.

xy-plane

$\frac{x^2}{5^2} + \frac{y^2}{3^2} = 1$



$x = 5\sin t \qquad y = 3\cos t$

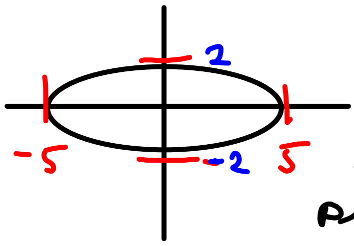
$\frac{x}{5} = \sin t \qquad \frac{y}{3} = \cos t$

$\left(\frac{x}{5}\right)^2 + \left(\frac{y}{3}\right)^2 = \frac{x^2}{5^2} + \frac{y^2}{3^2} = \sin^2 t + \cos^2 t = 1$

$\frac{x^2}{5^2} + \frac{y^2}{3^2} = 1$

xz-plane

$\frac{x^2}{5^2} + \frac{z^2}{4^2} = 1$



This is an ellipse that lives in the plane

$z = \frac{4}{3}y$

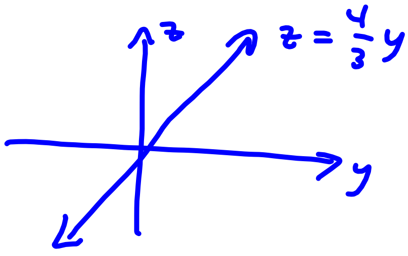
yz-plane

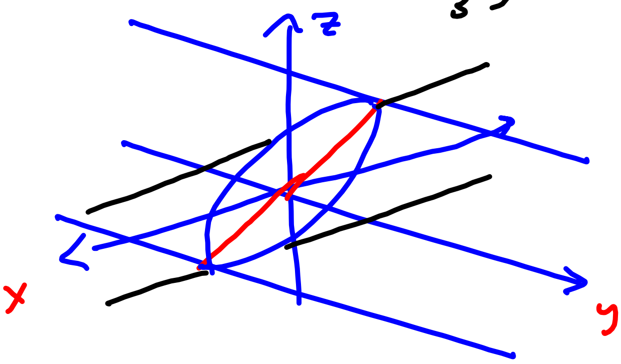
$y = 3\cos t$

$z = 4\cos t$

$\cos t = \frac{y}{3}$

$z = 4 \cdot \frac{y}{3} = \frac{4}{3}y$





$\bar{A} = \langle 0, 1, 2 \rangle$

Plane thru $A(0,1,2)$, $B(-1,3,1)$, $C(2,5,11)$

In vector form and general form.

$$\boxed{\bar{x} = \bar{A} + s\bar{u} + t\bar{v},}$$

$s, t \in \mathbb{R}$

$\bar{u} = \overrightarrow{AB} = -\langle 1, -2, 1 \rangle = \langle -1, 2, -1 \rangle$

$\bar{v} = \overrightarrow{AC} = -\langle -2, -4, -9 \rangle = \langle 2, 4, 9 \rangle$

$\bar{u} \times \bar{v} =$

$$\begin{array}{r} -\langle 1, -2, 1 \rangle \\ \times -\langle -2, -4, -9 \rangle \\ \hline \end{array}$$

$\bar{u} \times \bar{v} : \langle 22, -(-7), -8 \rangle$

$= \langle 22, 7, -8 \rangle = \bar{n}$

Let $\langle x, y, z \rangle$ position vector for pt on plane. Then $\langle x-0, y-1, z-2 \rangle$ is $\perp$ to $\bar{n}$.

So $\bar{n} \cdot \langle x-0, y-1, z-2 \rangle = 0$

$\langle 22, 7, -8 \rangle \cdot \langle x-0, y-1, z-2 \rangle$

$= 22(x-0) + 7(y-1) - 8(z-2) = 0$

etc. to $\underline{ax + by + cz = d}$