Quiz 2

Name: key

[4] **1.** Find parametric equations for the line through the points $P(1,0,4)$ and $Q(-2,1,1)$.

The line is parallel to $\overrightarrow{PQ} = \langle -2-1, 1-0, 1-4\rangle = \langle -3, 1, -3\rangle$, and passes thru $P(1,0,4)$, so has equations

$$\begin{cases} x = 1 - 3t \\ y = 0 + t \\ z = 4 - 3t \end{cases}$$

[8] **2.** A plane is given by the equation $x + 2y - z = 4$.

a) Find a vector orthogonal to the plane.

From the coefficients of the equation we see that $\langle 1, 2, -1\rangle$ is orthogonal to the plane. (2)

b) Find two points in the plane.

We can choose arbitrary values of two of the variables.

Taking $x=0$ and $y=0$ gives $-z=4$, so $P(0,0,-4)$ is in the plane. (2)

Taking $x=0$ and $z=0$ gives $2y=4$, or $y=2$, so $Q(0,2,0)$ is in the plane. (2)

c) Find a vector parallel to the plane.

$\overrightarrow{PQ} = \langle 0, 2, 4\rangle$ is parallel to the plane (2)

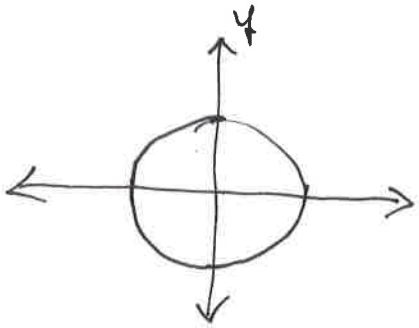
(There are many other possible answers.).

[4] **3.** Sketch the trace of the surface $x^2 + y^2 + z^2 = 2$ in the plane $z = 1$.

Putting $z=1$ gives $x^2+y^2+1^2=2$

or $x^2+y^2=1$.

Note: The graph of the equation is a sphere. The trace is a line of latitude.



4. Find a vector tangent to the curve $\mathbf{r}(t) = \langle 1, t^2, 5t\rangle$ at the point $P(1,9,15)$.

[4] A tangent vector is

(2) $\vec{r}\,'(t) = \langle 0, 2t, 5\rangle$

At this point, $t=3$, so $\vec{r}\,'(t) = \langle 0, 6, 5\rangle$.

(2)