Intro to Linear Algebra
Quiz 2

Summer 2017
Drew Armstrong

Problem 1.

(a) Find the equation of the line that is perpendicular to the vector $(1, 2)$ and contains the point $(0, 0)$.

$$\begin{pmatrix} x \\ y \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 2 \end{pmatrix} = 0$$

$$\boxed{x + 2y = 0}$$

(b) Find the equation of the line that is perpendicular to the vector $(1, 2)$ and contains the point $(1, 1)$.

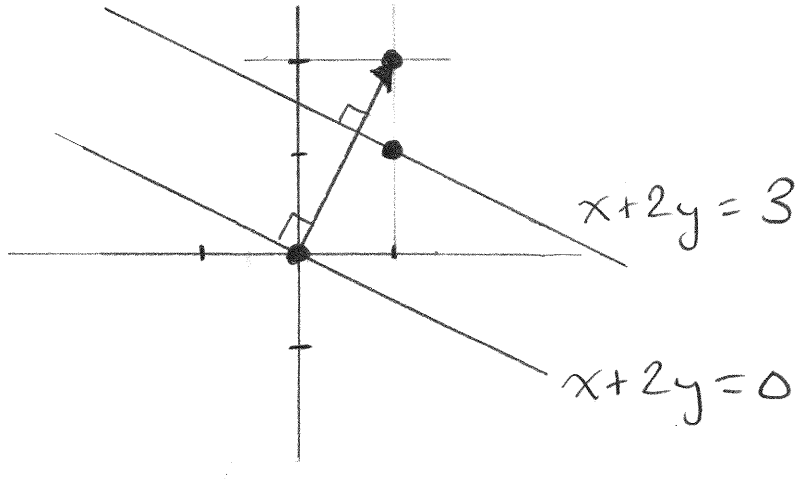
Eqn is $x + 2y = c$ for some c.

Plug in the point $(1, 1)$:

$$1 + 2(1) = c$$
$$3 = c$$

So the equation is $\boxed{x + 2y = 3}$

(c) Draw the lines from parts (a) and (b) on the same pair of axes. Label each line by its equation.



Problem 2.

(a) Find a parametrization for the line in 3D that contains the point $(1, 0, 0)$ and is parallel to the vector $(1, 2, 3)$.

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} + t \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$$

(b) Compute the intersection of the line from part (a) with the plane $x - y + z = 5$.

Substitute $x = 1+t$, $y = 2t$, $z = 3t$ to get

$$(1+t) - (2t) + (3t) = 5$$
$$1 + 2t = 5$$
$$2t = 4$$
$$t = 2$$

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} + 2 \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} = \begin{pmatrix} 3 \\ 4 \\ 6 \end{pmatrix}$$

(c) Is the line from part (a) perpendicular to the plane from part (b)? Why or why not?

NO. Because the direction vector $(1,2,3)$ is not parallel to the perpendicular vector $(1,-1,1)$ of the plane.

$$(1,2,3) \neq r(1,-1,1)$$

for any r