MATH 1210 A01 Summer 2013 Problem Workshop 7

1. If $\mathbf{u} = \langle 3, -2, 4\rangle$ and $\mathbf{v} = \langle -3, 6, 2\rangle$, find:
   (a) $2\mathbf{u} - 4\mathbf{v}$
   (b) $|\mathbf{u}|\,\hat{\mathbf{v}} + 3(\mathbf{u}\cdot\mathbf{v})\mathbf{u}$
   (c) $2\mathbf{u} \times (-3\mathbf{v})$
2. Prove that $\mathbf{v} \times \mathbf{u} = -(\mathbf{u} \times \mathbf{v})$
3. Find parametric equations for the line that passes through the origin and is parallel to the line
$$x + 2y + z = 7, \quad x - y - 3z = 25.$$
4. Find symmetric equations for the pine that passes through the point $(-1, 3, 4)$ and the point where the z-axis cuts the plane $x + 2y - 3z = 6$.
5. Find parametric equations for the line
$$x - 2y + 3z = 4, \quad 2x + y - z = -2.$$
6. Find the equation of the plane containing the point $(1, 3, -2)$ and the line
$$x = 3 + t, \quad y = -2 + 4t, \quad z = 1 - 2t$$
7. Find the equation of the plane containing the two lines
$$x = 2 + 6t, \quad y = 3 - 4t, \quad z = 1 + 8t$$
$$\frac{x-1}{3} = \frac{y+5/2}{-2} = \frac{1-z}{-4}$$
8. Show that the following two lines intersect and then find the equation of the plane containing the two lines
$$x = 1 + 2t, \quad y = 2 - t, \quad z = 3 + 3t$$
$$x = 1 + s, \quad y = 5 - 2s, \quad z = -2 + 4s$$

Answers

1. (a) $\langle 18, -28, 0 \rangle$
   (b) $\langle \frac{-3\sqrt{29}}{7} - 117, \frac{6\sqrt{29}}{7} + 78, \frac{2\sqrt{29}}{7} - 156 \rangle$
   (c) $\langle 168, 108, -72 \rangle$

2.

3. $x = -5t, \quad y = 4t, \quad z = -3t$

4. $-x = \dfrac{y}{3} = \dfrac{z+2}{6}$ or equivalently $-(x+1) = \dfrac{y-3}{3} = \dfrac{z-4}{6}$

5. $x = -t, \quad y = -2 + 7t, \quad z = 5t$ (Note that there are a lot of equivalent but different looking answers.)

6. $2x - 7y - 13z = 7$

7. $44x - 8y - 37z = 27$

8. $2x - 5y - 3z = -17$