

## MATH 1210 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 line 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.  $-x = \frac{y}{3} = \frac{z+2}{6}$  or equivalently  $-(x+1) = \frac{y-3}{3} = \frac{z-4}{6}$
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.  $2x - 5y - 3z = -17$