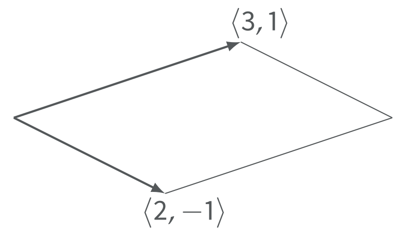
Math 143 Set 13

1. Find the area of this parallelogram:



2. Simplify $|\mathbf{u} \times \mathbf{v}|^2 + (\mathbf{u} \cdot \mathbf{v})^2$ for vectors $\mathbf{u}, \mathbf{v}$ in $\mathbb{R}^3$. (Hint: use the angle between them, θ.)

3. Find the parametric equations for the lines described below:

a. The line passing through the point $(2, 3, -1)$ and parallel to $\langle 1, 0, 1\rangle$.

b. The line passing through the point $(0, 3, -1)$ and perpendicular to both $\langle 2, 2, 1\rangle$ and $\langle 1, -2, 1\rangle$.

c. The line passing through the points $(0, 1, -1)$ and $(2, 2, 2)$.

d. The line containing $(2, 1, 1)$ and perpendicular to both $\langle 1, 1, 0\rangle$ and $\langle 0, 1, 2\rangle$.

4. Find the equation for the planes described below:

a. The plane passing through $(1, -1, 1)$ and perpendicular to the vector $\langle 1, 2, 3\rangle$.

b. The plane passing through the origin in $\mathbb{R}^3$ and parallel to the plane $2x - y + z = 3$.

c. The plane that contains the line

$$\begin{cases} x = 3 + 2t, \\ y = t, \\ z = 8 - t, \end{cases}$$

for $t \in \mathbb{R}$ and is parallel to $2x + 4y + 8z = 17$.

d. The plane which passes through the points $(1, 2, 3)$, $(4, 5, 6)$, and $(7, 8, 10)$.

e. The plane which passes through the point $(1, 2, 3)$ and contains the line

$$\begin{cases} x = 3t, \\ y = 1 + t, \\ z = 2 - t, \end{cases}$$

for $t \in \mathbb{R}$.

f. The plane containing all points equidistant from the points $(1, 0, -2)$ and $(3, 4, 0)$.

g. The plane containing $(2, 0, -1)$ and perpendicular to the line $\begin{cases} x = 4 - t \\ y = -1 \\ z = 2 + 2t \end{cases}$.