Math 215 Homework 4

Problem 25

Find and equation of the plane that passes through the points (0,1,1), (1,0,1), and (1,1,0)

Finding vector normal to the plane

Let p = (0,1,1), q = (1,0,1), r = (1,1,0)
$\bar{A} = \bar{pq} = \langle 1-0, 0-1, 1-1 \rangle = \langle 1, -1, 0 \rangle$
$\bar{B} = \bar{pr} = \langle 1-0, 1-1, 0-1 \rangle = \langle 1, 0, -1 \rangle$

Normal Vector = $\bar{A} \times \bar{B}$

$\bar{Y} = \bar{A} \times \bar{B} = \langle (-1)(-1) - (0)(0), (0)(0) - (1)(-1), (1)(0) - (1)(-1) \rangle$
$\bar{Y} = \langle 1, 1, 1 \rangle$

Finding equation of the plane

$$\bar{Y} = \langle \text{a,b,c} \rangle = \langle 1,1,1 \rangle$$
$$\text{p} = (x_0, y_0, z_0) = (0,1,1)$$
$$\text{a(x-}x_0\text{) + b(y-}y_0\text{) + c(z-}z_0\text{) = 0}$$
$$1\text{(x-0) + 1(y-1) + 1(z-1)}$$
$$\text{x+(y-1)+(z-1)}$$
$$\text{x+y+z-2}$$
$$\text{x+y+z=2}$$

Problem 26

Find and equation of the plane that passes through the origin and the points (2,-4,6) and (5,1,3)

Finding vector normal to the plane

Let p = (0,0,0), q = (2,-4,6), r = (5,1,3)
$\bar{A} = \bar{pq} = \langle 2-0, -4-0, 6-0 \rangle = \langle 2, -4, 6 \rangle$
$\bar{B} = \bar{pr} = \langle 5-0, 1-0, 3-0 \rangle = \langle 5, 1, 3 \rangle$

Normal Vector = $\bar{A} \times \bar{B}$

$\bar{Y} = \bar{A} \times \bar{B} = \langle (-4)(3) - (6)(1), (6)(5) - (2)(3), (2)(1) - (-4)(5) \rangle$
$\bar{Y} = \langle -18, 24, 22 \rangle$

Finding equation of the plane

$$\bar{Y} = \langle \text{a,b,c} \rangle = \langle \text{-18,24,22} \rangle$$
$$\text{q} = (x_0, y_0, z_0) = (\text{2,-4,6})$$
$$\text{a(x-}x_0\text{) + b(y-}y_0\text{) + c(z-}z_0\text{) = 0}$$
$$\text{2(x-(-18)) + -4(y-24) + 6(z-22)}$$
$$\text{2(x+18)-4(y-24)+6(z-11)}$$
$$\text{2x - 4y + 6z - 36 + 116 - 66 = 0}$$
$$\text{2x + 4y + 6z = 14}$$