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

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

Math215

Homework 4, Problem 3

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10.5 Pr31

Find and equation of the plane that passes through the point (1,5,1) and is perpendicular to the planes 2x + y - 2z = 2 and x + 3z = 4

Finding vector normal to the plane

$$< a_1, a_2, a_3 > \times < b_1, b_2, b_3 >=< a_y b_z - a_z b_y, a_z b_x - a_x b_z, a_x b_y - a_y b_x > \quad (1)$$

$< 2, 1, -2 > \times < 1, 0, 3 >=< (1)(3)-(-2)(0), (-2)(1)-(2)(3), (2)(0)-(1)(1) >=< 3, -8, -1 >$

Finding normal vector through the point

$$a(x - x_0) + b(y - y_0) + c(z - z_0) = 0 \quad (2)$$

$$3(x - 1) - 8(y - 5) - (z - 1) = 0$$

$$3x - 3 - 8y + 40 - z + 1 = 0$$

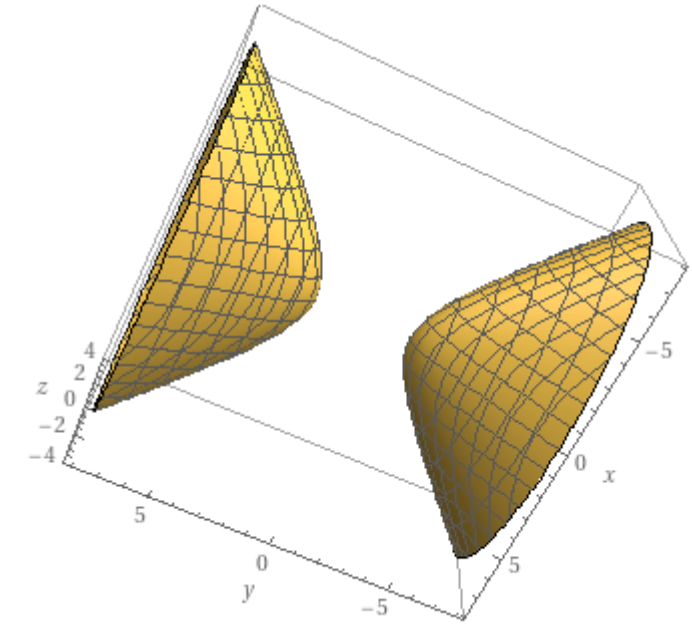
$$3x - 8y - z = -38$$

1 Math 215 Homework 4 Question 7

Reduce to Standard Form and State the shape

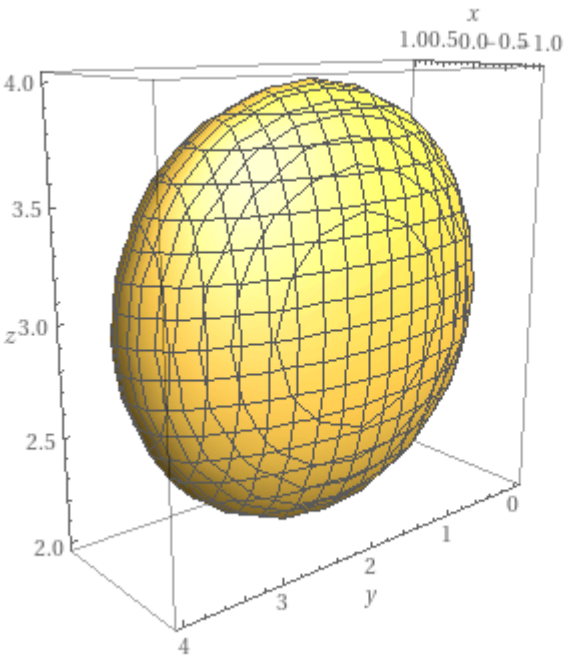
24: $y^2 = x^2 + 4z^2 + 4$
$y^2 - x^2 - 4z^2 = 4$
$\frac{y^2}{4} - \frac{x^2}{4} - z^2 = 1$

shape is a hyperboliod of two sheets



25: $4x^2 + y^2 + 4z^2 - 4y - 24z + 36 = 0$
$4x^2 + y^2 + 4(z^2 - 6z + 9) = 0$
$4x^2 + y^2 - 4y + 4(z - 3)^2 = 0$
$4x^2 + y^2 - 4y + 4 + 4(z - 3)^2 = 4$
$4x^2 + (y - 2)^2 + 4(z - 3)^2 = 4$
$x^2 + \frac{(y-2)^2}{4} + (z - 3)^2 = 1$

shape is an ellipsoid



26: $4y^2 + z^2 - x - 16y - 4z + 20 = 0$
$4y^2 - 16y + 16 + z^2 - 4z + 4 = x$
$4(y^2 - 4y + 4) + z^2 - 4z + 4 = x$
$4(y - 2)^2 + (z - 2)^2 = x$
$(y - 2)^2 + \frac{(z-2)^2}{4} = \frac{x}{4}$

shape is an elliptic parabaloid