Math215

Homework 4, Problem 3

November 24, 2021

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

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

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

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

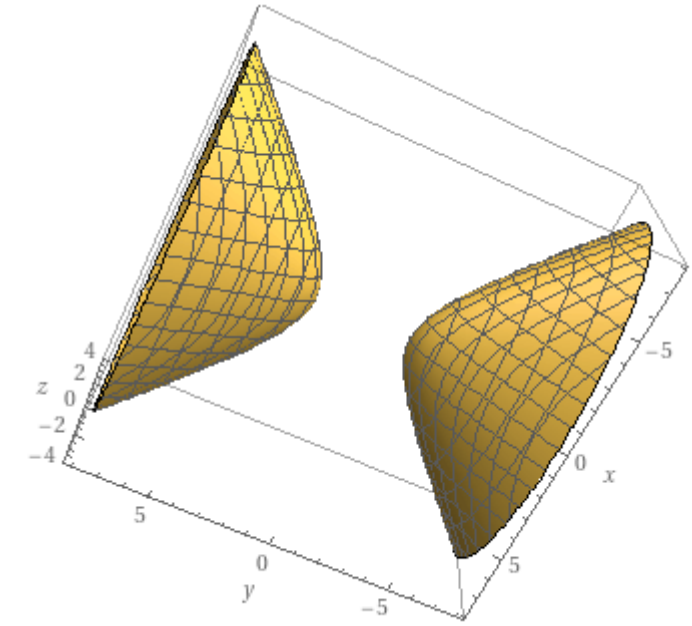
$$3x - 8y - z = -38$$

1 Math 215 Homework 4 Question 7

Reduce to Standard Form and State the shape

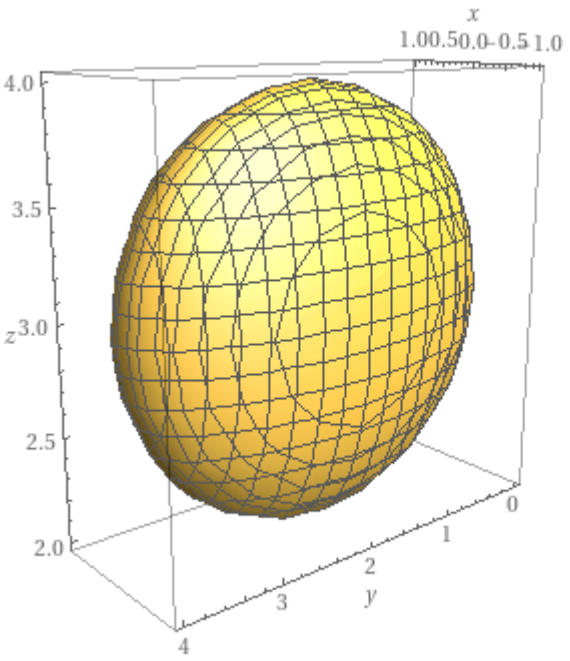
24: $y^2 = x^2 + 4z^2 + 4$
$y^2 - x^2 - 4z^2 = 4$
$\frac{y^2}{4} - \frac{x^2}{4} - z^2 = 1$

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