

ING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
DEPARTMENT OF MATHEMATICAL SCIENCES

MATH 201-06

Quiz # 3

April 07, 2008

1. (a) Find symmetric equations for the line of intersection of the two planes $\Pi_1 : x - 2y + z = 8$ and $\Pi_2 : 2x + y + z = 8$

Solution:

Rewrite the two equations as

$$2y - x = z - 8, \quad -2x - y = z - 8.$$

Solve the above system for x and y to get

$$x = -3y, \quad y = \frac{z - 8}{5}.$$

Thus, the symmetric equations can be written as

$$\frac{x}{-3} = y = \frac{z - 8}{5}.$$

- (b) Find the angle between the two planes Π_1 and Π_2 of Part a.

Solution:

$$N_1 = \langle 1, -2, 1 \rangle, \quad N_2 = \langle 2, 1, 1 \rangle.$$

$$\cos \theta = \frac{N_1 \cdot N_2}{|N_1| |N_2|} = \frac{1}{6}.$$

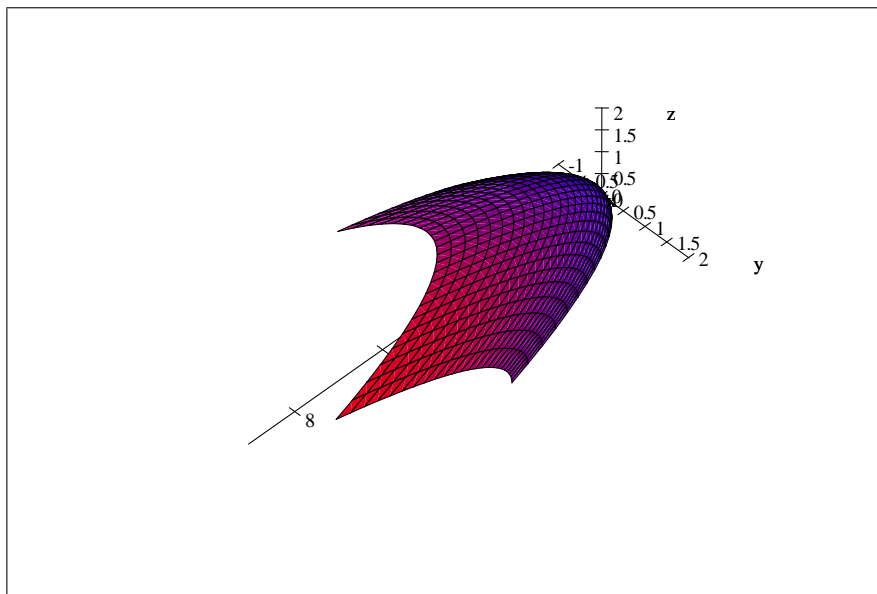
$$\theta = \cos^{-1} \frac{1}{6}.$$

- (c) Identify and sketch the surface $x - y^2 - z^2 = 1$.

Solution:

$$x = 1 + y^2 + z^2$$

The surface is a paraboloid with axis along the x -axis and vertex at $(1, 0, 0)$



2. Identify the surface whose equation is given by $z = r^2$.

Solution:

Changing to rectangular coordinates we get

$$z = x^2 + y^2$$

so the surface is a circular paraboloid with axis along the z -axis and vertex at $(0, 0, 0)$.