

Unit 4 Exam Analysis 2013/14 Student Lost in Space
3-D graphing and different types of coordinates

1. Identify the following 3-d surfaces by name: [3 each]

a) $2x + 3z = -16$

a) _____

b) $y = 3z^2$

b) _____

c) $2y^2 - 2x^2 + 5z = 2$

c) _____

d) $(x-3)^2 + (y+5)^2 = z^2$

d) _____

e) $x^2 + y^2 + 5z^2 = 22$

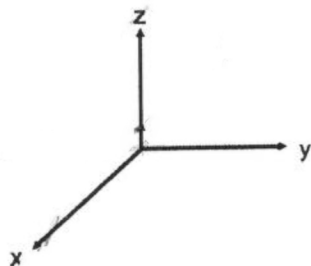
e) _____

f) $2x^2 - y^2 + 3z^2 = 15$

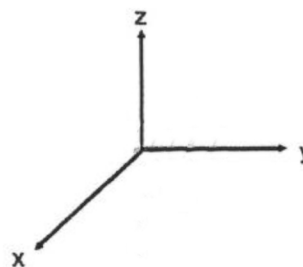
f) _____

2. Sketch the following in 3 - d [4 each]

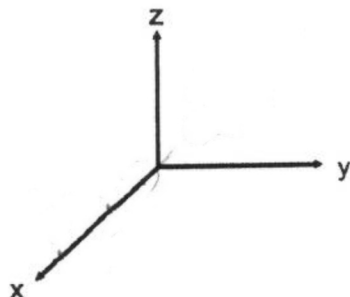
a) $z = e^y$



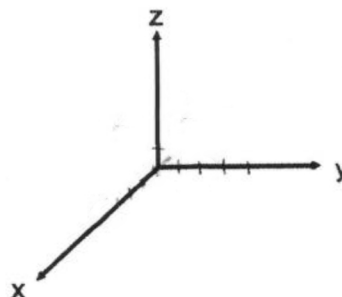
b) $-3x + 5y - 3z = 15$



c) $\frac{z^2}{9} + \frac{y^2}{16} - \frac{x^2}{5} = -1$



d) $\frac{z^2}{9} + \frac{x^2}{16} - \frac{y}{4} = 1$



e) For "c" above state the domain (all possible x values) _____

3. Which one of the points below (in polar coordinates) does *not* map to the same point as $\left(4, -\frac{\pi}{3}\right)$? (circle one) [3 each for M.C.]

- (a) $\left(-4, \frac{2\pi}{3}\right)$ (b) $\left(-4, -\frac{4\pi}{3}\right)$ (c) $\left(4, \frac{5\pi}{3}\right)$ (d) $\left(4, \frac{14\pi}{3}\right)$ (e) $\left(-4, \frac{8\pi}{3}\right)$

4. The graph of $r = -3\csc\theta$ can best be described as a... (circle one)

- (a) horizontal line (b) vertical line (c) circle
(d) line with negative slope (e) line with positive slope

5. Convert the point $\left(6, \frac{4\pi}{3}\right)$ from polar coordinates to rectangular coordinates. (circle one)

- (a) $(-3\sqrt{2}, 3\sqrt{2})$ (b) $(-3\sqrt{3}, 3)$ (c) $(-3, 3\sqrt{3})$
(d) $(-3\sqrt{3}, -3)$ (e) $(-3, -3\sqrt{3})$

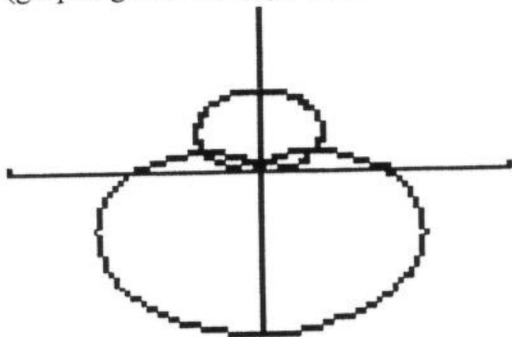
6. The polar function $r = 2\tan\theta\sec\theta$ is a parabola. Convert it to simplified rectangular form. [4]

7. Clearly describe the shape, size and orientation of the intersection of the two 3-d surfaces below. Be very specific. [4]

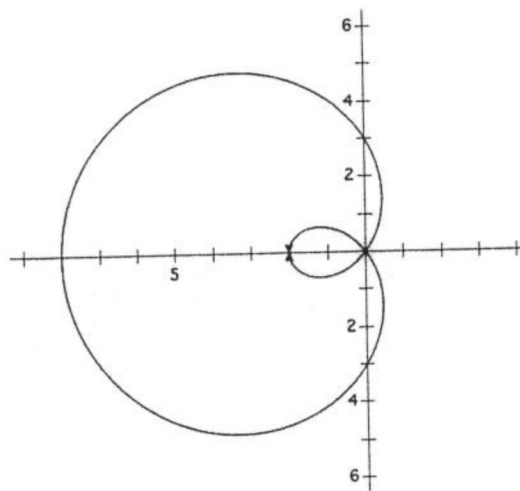
$$x^2 + y^2 + z^2 = 120 \text{ and}$$

$$x^2 + y^2 - z^2 = 100$$

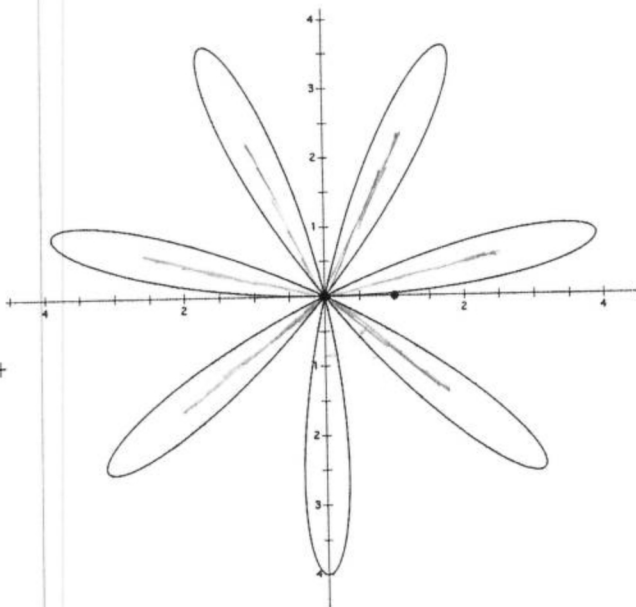
8. Find the geometric points of intersections of the two curves: $r = \sin \theta$ and $r = 1 - \sin \theta$ (graphs given below). Leave answers in the form (r, θ) . [5]



9. Write an equation for the following two polar functions: [4 each]



$r =$ _____



$r =$ _____

- b) Along what angle is the first petal (past 0 degrees) in the rose above right? [2]

10. Write the equation of a plane with the following intercepts: $(3, 0, 0)$ $(0, 2, 0)$ and $(0, 0, 5)$. [3]

11. Name two planes that are parallel to the z axis that pass through the point $(3, 5, 7)$. [3]

Plane 1 _____ Plane 2 _____

12. The Cartesian coordinates for point P are (a, a, a) where " a " is a positive constant.

a) Write P in cylindrical coordinates (in terms of " a "). [3]

b) Write P in spherical coordinates. (also in terms of " a ") [3]

13. a) Write the following spherical point $Q = (\rho, \theta, \phi) = (5, \frac{7\pi}{6}, \frac{\pi}{6})$ as a rectangular point (x, y, z) [3]

b) Sketch point Q , as accurately as possible, labeling (ρ, θ, ϕ) [3]