

## Assignment 1

15 questions

$\times 2 = 10$  marks)

1a Find the polar coordinates  $(r, \theta)$  for each of the following points that are given in Cartesian coordinates  $(x, y)$ .

i)  $(2, 2)$

ii)  $(-3, 4)$

b Find the cartesian coordinates  $(x, y)$  for each of the following points that are given in polar coordinates  $(r, \theta)$ .

i)  $(4, 100^\circ)$

ii)  $(0, \frac{\pi}{6})$

2a Find the spherical coordinates  $(r, \theta, \phi)$  for each of the following points that are given in cartesian coordinates  $(x, y, z)$ .

i)  $(3, 4, 5)$

ii)  $(-3, -4, 5)$

b Find the cartesian coordinates  $(x, y, z)$  for each of the following points that are given in spherical coordinates  $(r, \theta, \phi)$ .

i)  $(3, \frac{\pi}{6}, \frac{2\pi}{3})$

ii)  $(2, -35^\circ, 30^\circ)$

3 Plot  $r = 2 \sin 3\theta$  on a polar plot.

In problems 4 & 5, be sure to start by drawing a neat diagram.

4. Consider a two dimensional circular disk with a hole. The inner radius is 2 cm and the outer radius is 10 cm. Find the mass of the disk if its density (mass per unit area)  $d = d_0 r^2$  where  $d_0 = 5 \text{ gm/cm}^4$  and  $r$  is the distance from the disk center.

5. Consider a sphere of radius 5 cm having a density (mass per unit volume)  $d = d_0 r^2 \cos^2 \theta \sin^2 \phi$  where  $d_0 = 4 \text{ gm/cm}^5$ . Find the sphere's mass.