

# Math 1497 - Sample Test 3

1. Sketch the following parametric curve and find the equation of the tangent at the point of self intersection

$$x = t^3 - 4t + 3, \quad y = t^2, \quad t = -3..3.$$

2. Graph the following polar equations

$$r = 2 + 2 \sin \theta, \quad r = 2 \sin 2\theta,$$

3. Find the area inside one leaf of the rose described by

$$r = 2 \sin 3\theta.$$

4. Find the area of the following:

- (i) inside  $r = 2 + 2 \sin \theta$ ,
- (ii) inside the outer loop and outside the inner loop of  $r = 1 - 2 \sin \theta$ ,
- (iii) outside  $r = \cos 2\theta$  and inside  $r = \sin 2\theta$  on  $[0, \frac{\pi}{2}]$ .

5. Find the projection of the vector  $\vec{u}$  onto  $\vec{v}$  where  $\vec{u} = \langle 2, 3 \rangle$ , and  $\vec{v} = \langle 4, 2 \rangle$ . Sketch both vectors, the projected vector and the orthogonal complement.

6. (i) Find the equation of the plane that contains the vector  $\langle 1, 2, 4 \rangle$  and the points  $(1, 1, 1)$  and  $(-2, 3, 7)$ .  
(ii) Find the equation of the plane that contains the points  $(1, 3, 5)$ ,  $(2, -1, 2)$  and  $(0, 4, 6)$ .
7. (i) Find the equation of the line that passes through the points  $(1, 2, 4)$  and  $(-2, 3, 7)$ .  
(ii) Find the equation of the line perpendicular to the plane  $x + 2y - 3z = 6$  passing through the point  $(1, -1, 3)$ .