Name: \_\_\_\_\_

TA's Name: \_\_\_\_\_

**Instructions:** You must show supporting work to receive full and partial credits. No text book, notes, formula sheets allowed.

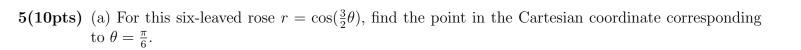
**1(15pts)** Two points, P(1, 1, 1), Q(2, 2, 0), are given.

- (a) Find the mid-point between P and Q. (Suggestion: draw a picture, not necessarily to the scale, to show the mid-point.)
- (b) If  $\vec{v} = <1,2,3>$ , find the point R that is  $2\vec{v}$  from the point P.
- (c) Find the angle between  $\vec{PQ}$  and  $\vec{v}$ .

**2(10pts)** (a) Find the equation in the polar coordinate for the curve by the equation  $\sqrt{x^2 + y^2} + \frac{y}{x} = 1$ .

(b) Find the equation for the curve  $r = \sin \theta$  in the Cartesian coordinate.

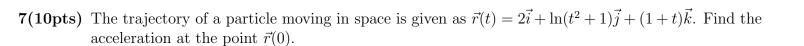
$3(10 \mathrm{pts})$	You are given two points $P(1,1,1), Q(2,2,0)$ . (a) Find a system of parametric equations for the line through the points $P,Q$ .
	(b) Find the distance from a third point $R(1,2,3)$ to the line through $P,Q$ . (Suggestion: draw a picture, not necessarily to the scale, to assist your solution.)
$4(10 \mathrm{pts})$	You are given three points $P(1,1,1), Q(2,2,0), R(3,0,1)$ . (a) Find the area of the triangle with the vertexes $P,Q,R$ .



(b) Find the slope of the tangent line to the curve at that point.

**6(10pts)** (a) Find the intersections of the circles r = 1 and  $r = 2\cos\theta$ .

(b) Sketch a graph of each circle, and find the area outside r = 1 but inside  $r = 2\cos\theta$ .



**8(10pts)** A force of 10 lb pulling an object at an angle of 45° with a plane. Find the work done to move it 5 feet on the plane.

**9(15pts)** A bomb was dropped from a bomber at an altitude of 1000 m when it travels at a ground speed of 180 m/sec. Find the distance ahead at which the bomb will hit the ground.

**<sup>2</sup> Bonus Points**: Calculus was invented in (a) the 16th century, (b) the 17th century, (c) the 18th century, (d) the 19th century. (... The End)