

KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
DEPARTMENT OF MATHEMATICS AND STATISTICS

MATH 201

Exam # 1

Oct 24, 2007

NAME:

ID#:

SHOW ALL YOUR WORK

1. (4 points) Give the missing values:

(a) $(-2, -\frac{\pi}{2})$ in polar coordinates = (,) in rectangular coordinates.

(b) $(2, \frac{5\pi}{4})$ in polar coordinates = $(-2, \quad)$ in polar coordinates.

(c) $(3, \frac{7\pi}{6})$ in polar coordinates = $(\quad, \frac{\pi}{6})$ in polar coordinates.

(d) $(2, -2)$ in rectangular coordinates = $(\quad, \frac{3\pi}{4})$ in polar coordinates.

2. (4 points) Set up an integral to compute the common area between the rose $r = \sin 2\theta$ and the circle $r = \cos \theta$.

3. A parametric curve is said to cross itself if it passes through the same point (x, y) for two distinct values of the parameter t .
- (a) **(4 points)** Show that the curve $x = t^3 - 4t$, $y = t^2$ crosses itself at the point $(0, 4)$ and give the values of t at which the curve crosses itself.
- (b) **(4 points)** Find the equations of the two tangent lines to the curve in part (a) at the point $(0, 4)$.

4. (a) **(2 points)** Show that the equation of the cardioid $r = 1 + \cos \theta$ can be written as $r = 2 \cos^2 \frac{\theta}{2}$.
- (b) **(4 points)** Find the arclength of the cardioid in part (a).

5. (a) **(4 points)** Use triple scalar product to determine whether the points $P(1, 0, 1)$, $Q(2, 4, 6)$, $R(3, -1, 2)$ and $S(6, 2, 8)$ lie in the same plane.
- (b) **(4 points)** Find the scalar and vector projections of the vector $\mathbf{u} = \langle 2, -3, 1 \rangle$ onto the vector $\mathbf{v} = \langle 1, 6, -2 \rangle$.