

KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
DEPARTMENT OF MATHEMATICS AND STATISTICS
MATH 201
Exam # 1
March 19, 2008

NAME:

ID#:

SHOW ALL YOUR WORK

1. **(4 points)** Find all points on the polar curve $r = 1 + \cos \theta$ where the tangential line is
(a) horizontal and (b) vertical.

2. **(4 points)** Find the length of the polar curve $r = e^{2\theta}$, $0 \leq \theta \leq 2\pi$.

3. **(4 points)** Find x such that the points $P(x, 0, 1)$, $Q(2, 4, 6)$, $R(3, -1, 2)$ and $S(6, 2, 8)$ lie in the same plane.

4. (a) **(2 points)** Find the center and radius of the sphere $x^2 + y^2 + z^2 = 4x - 2y$.

(b) **(4 points)** Find an equation of the largest sphere with center at $(6, 2, 3)$ that is contained in the first octant.

5. (a) **(4 points)** Find $|\mathbf{a}|$, $\mathbf{a} + \mathbf{b}$, $\mathbf{a} - \mathbf{b}$ and $3\mathbf{a} + 4\mathbf{b}$ for $\mathbf{a} = \langle -3, -4, -1 \rangle$, $\mathbf{b} = \langle -1, 5, -2 \rangle$
- (b) **(4 points)** Find a vector that has the same direction as $\langle -2, 4, 2 \rangle$ but has length 6.

6. **(4 points)** Find the scalar and vector projections of the vector $\mathbf{v} = 2\mathbf{i} - 3\mathbf{j} + \mathbf{k}$ onto the vector $\mathbf{w} = \mathbf{i} - 2\mathbf{j}$.