HOMEWORK 9 - MATH 152

DUE DATE: Monday, December 13
INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. One part of each homework problem will be chosen at random and graded. Each question is worth 1 point. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Consider the following points given in rectangular coordinates. Find two pairs of polar coordinates for each, one pair satisfying $r \geq 0$ and $0 \leq \theta < 2\pi$, and the other satisfying $r \geq 0$ and $-\pi < \theta \leq \pi$:

$$(a)\ (2\sqrt{3}, -2), \qquad (b)\ (8, -8)$$

2. Identify the following curves by transforming the given equation from polar to rectangular coordinates:

$(a)\ r = 5\sec\theta \qquad (b)\ r = 2\sin\theta \qquad (c)\ r = 4\cos\theta + 4\sin\theta \qquad (d)\ r = \sec\theta\tan\theta.$

3. Sketch the following curves in polar coordinates:

$$(a)\ \theta = -\frac{3\pi}{4} \qquad (b)\ r = 3 \qquad (c)\ r = 4\sin\theta.$$

4. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at the point $\theta = \frac{\pi}{3}$ without eliminating the parameter if $x = 2\theta + \cos\theta$ and $y = 1 - \sin\theta$.

5. Show that the curve with parametric equations $x = t^2 - 3t + 5, y = t^3 + t^2 - 10t + 9$ intersects itself at the point $(3, 1)$, and find equations for the two tangent lines to the curve at the point of intersection.

6. Find the slope of the tangent line to the polar curve $r = 4 - 3\sin\theta$ for $\theta = \pi$.

7. Calculate the arc length of the polar curve $r = \sin^3(\frac{\theta}{3})$ from $\theta = 0$ to $\theta = \frac{\pi}{2}$.

8. Find the area of the region outside the cardioid $r = 2 - 2\cos\theta$ and inside the circle $r = 4$. Make a sketch of the curves on a polar system with your calculators for my benefit.