Name:

Math 116 Exam 3

April 12, 2012

Directions: WRITE YOUR NAME ON THIS EXAM! Except where indicated, merely finding the answer to a problem is not enough to receive full credit; you must show how you arrived at that answer. DO NOT convert irrational numbers such as $\sqrt{3}$ or π into decimal approximations; just leave them as they are.

1) By eliminating the parameter, find a Cartesian equation, i.e. one in x and y, for the following parametric curves.

a) (8 points) $x(t) = 9t + 1,\ y(t) = -162t^2 - 36t$

b) (12 points) $x(t) = \sin(t),\ y(t) = 1 + \cos(2t)$

2) (13 points) Determine the equation of the tangent line to the parametric curve given by $x(t) = \sqrt{t^3 + 1},\ y(t) = \cot\left(\frac{\pi t}{8}\right)$ at the point $t = 2$.

SIMPLIFY ALL NUMBERS IN YOUR ANSWER!

3) Consider the power series $\displaystyle\sum_{n=1}^{\infty} \frac{(24-4x)^n}{n^{1/3}+7}$.

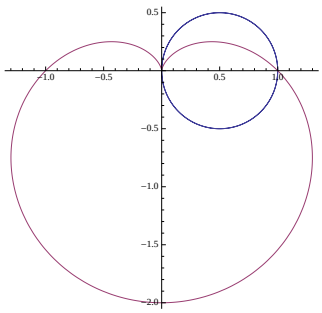
a) (3 points) What is the center of the series?

b) (12 points) Find the radius of convergence of the series.

4) (12 points) Given that the radius of convergence of $\sum_{n=1}^{\infty} \frac{(24-4x)^n}{n^{1/3}+7}$ is $1/4$, find the interval of convergence.

5) (12 points) Find the MacLaurin series for $f(x) = \dfrac{5x}{e^{x^2}}$.

6) Consider the region in the 1st quadrant outside the curve $r = 1 - \sin(\theta)$ but inside the curve $r = \cos(\theta)$. See the graph below.



a) (3 points) Shade the indicated region.

b) (9 points) Find the θ values for which the curves intersect if $0 \leq \theta \leq \dfrac{\pi}{2}$. *Hint:* a commonly-used identity may help.

c) (6 points) Set up BUT DO NOT EVALUATE an integral or integrals representing the area of the indicated region.