Math 0230

## Midterm Exam 2

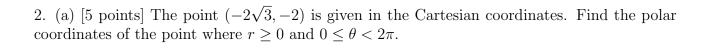
Lecture time: 9 am

Fall 2013

Your name:

No calculators, no books. Show all your work (no work = no credit). Write neatly. Simplify your answers.

1. [10 points] Find an equation of the tangent line to the parametric curve  $x = 3t^2 + 1$ ,  $y = 2t^3 + 1$  at the point where t = -1. Represent the equation in the slope-intercept form.



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(b) [5 points] The point  $\left(2,\frac{4\pi}{3}\right)$  is given in the polar coordinates. Find the Cartesian coordinates of the point.

3. [10 points] Find the area of the region that lies inside the curve  $r=\cos\theta$  and outside the curve  $r=1-\cos\theta$ .

4. Determine whether the series is convergent or divergent. If it is convergent, find its sum.

(a) [5 points] 
$$\sum_{n=1}^{\infty} \sqrt[n]{2.5}$$

.....

(b) [5 points] 
$$\sum_{n=1}^{\infty} (\cos 1)^n$$

5. Determine whether the series is convergent or divergent. Do not find its sum. Show all your work. Mention a method used.

(a) [10 points] 
$$\sum_{n=1}^{\infty} \frac{1}{n^2 + 2n}$$

.....

(b) [10 points] 
$$\sum_{n=1}^{\infty} \frac{(-1)^n}{2n}$$

.....

(c) [10 points] 
$$\sum_{n=1}^{\infty} \frac{3^n(n+2)}{n!}$$

6. Express the function as a power series. Find the radius of convergence R of the obtained power series.

(a) [10 points] 
$$\frac{2}{2+x}$$

.....

(b) [10 points] 
$$\frac{2}{(2+x)^2}$$

7. [10 points] Find the Taylor series for the function  $f(x) = \ln x$  centered at a = 1. Represent the series in sigma  $\sum$  form.

bonus problem [15 points extra] Find the sum of the series

$$3 - \frac{\pi^2}{3 \cdot 2!} + \frac{\pi^4}{27 \cdot 4!} - \frac{\pi^6}{243 \cdot 6!} + \cdots$$