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Math 110 Sec S07N01 Test 3 – Apr 4 2007

name (printed)	*student number*

I have read and understood the instructions below:

signature

Instructions:

1. No notes or books are to be used in this test. If you need scrap paper please ask and some will be provided. A formula sheet is given on page 7.
2. A non-programmable, non-graphing calculator is permitted.
3. There are 7 pages (including this cover page) in the test. Justify every answer, and clearly show your work. Unsupported answers will receive no credit.
4. You will be given 50 minutes to write this test. Read over the test before you begin.
5. At the end of the test you will be given the instruction "Put away all writing implements and remain seated." *Continuing to write after this instruction will be considered as cheating.*
6. **Academic dishonesty:** Exposing your paper to another student, copying material from another student, or representing your work as that of another student constitutes academic dishonesty. Cases of academic dishonesty may lead to a zero grade in the test, a zero grade in the course, and other measures, such as suspension from this university.

Question	value	score
1	10	
2	10	
3	10	
4	10	
5	10	
Total	**50**	

Question 1:

(a)[5 points] Find the first three non-zero terms of the Maclaurin series for $x^2 \sin(x^2)$.

(b)[5 points] Use Taylor (or Maclaurin) series to find

$$\lim_{x \to 0} \frac{x^2 \sin(x^2) - x^4}{x^8} .$$

Question 2:

(a)[5 points] Eliminate the parameter and sketch the curve given by the parametric equations

$$x = \ln(t) \ , \qquad y = \frac{t^3}{3} - 1$$

where $t > 0$. Indicate the orientation of the curve.

(b)[5 points] Determine the value(s) of t where tangent lines to the curve in (a) have slope 1.

Question 3 [10 points]

Find the arclength of the curve given by the parametric equations

$$x = t^2 \ , \qquad y = t^3$$

on the interval $1 \leq t \leq 2$.

Question 4:

(a) **[5 points]** The coordinates of a point in polar coordinates are $(-3, 2\pi/3)$. Plot the point and find the corresponding representation of the point in rectangular coordinates.

(b) **[5 points]** The coordinates of a point in rectangular coordinates are $(-3, -4)$. Plot the point and find one representation of the point in polar coordinates.

Question 5:

(a)[7 points] Carefully sketch the the polar curve

$$r = 3\sin(2\theta)$$

and label the points corresponding to $\theta = \pi/4$ and $\theta = 3\pi/4$.

(b)[3 points] Find the slope of the tangent line to the curve when $\theta = \pi/6$.

You may find some of the following useful:

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots$$

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots$$

$$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \cdots$$

$$\frac{1}{1-x} = 1 + x + x^2 + x^3 + \cdots, \qquad |x| < 1$$

$$\ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \cdots, \qquad |x| < 1$$

$$\sin\left(\frac{\pi}{4}\right) = \cos\left(\frac{\pi}{4}\right) = \frac{1}{\sqrt{2}}$$

$$\sin\left(\frac{\pi}{6}\right) = \cos\left(\frac{\pi}{3}\right) = \frac{1}{2}$$

$$\sin\left(\frac{\pi}{3}\right) = \cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$$