Name: _____

Calculus 2

MA126-6B

Midterm Examination 2

Tuesday, November 18, 2003

Instruction: Answer the questions in the space provided. Use the scratch paper provided if needed. Please keep your answers neat, complete but brief, and to the point.

Question 1	_____
Question 2	_____
Question 3	_____
Question 4	_____
Question 5	_____
Question 6	_____
Question 7	_____
Question 8	_____
Question 9	_____
Question 10	_____
Total	_____

Please do not write in this box

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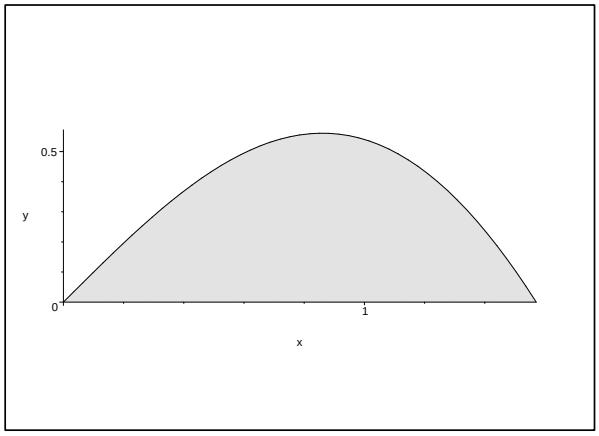
QUESTION 1. Find the volume of the solid of revolution obtained by rotating the area under the curve

$$y = x\cos x, \qquad 0 \le x \le \pi/2,$$

about the y-axis:



Hint: Use cylindrical shells.

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QUESTION 2. Find the area bounded by the two curves:

$$y^2 = x + 2, \qquad y = |x|.$$

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QUESTION 3. Find the arclength of the curve:

$$x = y^{3/2}, \qquad 0 \leq y \leq 1.$$

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QUESTION 4. Check that the function:

$$f(x) = \begin{cases} 6x(1-x) & \text{if } 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

is a probability density function. Find the mean, standard deviation, and median.

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QUESTION 5. Find the limit:

$$\lim_{n\to\infty} \frac{n\cos n}{n^2+1}.$$

Justify you answer.

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QUESTION 6. Determine whether the following series converges:

$$\sum_{n=1}^{\infty} \ln\left(1+\frac{1}{n}\right).$$

Justify your answer.

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QUESTION 7. Determine whether the following series converges, converges absolutely, or converges conditionally:

$$\sum_{n=2}^{\infty} \frac{(-1)^n}{n \ln n}.$$

Hint: Use the integral test.

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QUESTION 8. Find the Maclaurin series for the function:

$$f = \frac{1}{(1-x)^2}.$$

Determine the interval of convergence.
Hint: $1/(1-x)^2$ *is the derivative of* $1/(1-x)$.

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QUESTION 9. Let $f(x) = x \arctan x$. Find $f^{(126)}(0)$, the 126^{th} derivative of f at $x = 0$.
Hint: Find the Maclaurin series of f, and use Taylor's formula for the 126^{th} coefficient.

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QUESTION 10. Check that the series

$$\sum_{n=0}^{\infty} \frac{1}{(2n)!}$$

converges, and find its sum.
Hint: Find the Maclaurin series of $\cosh x = (e^x + x^{-x})/2$.