Math 126: Calculus II Name:_____
Final *December 17, 2002* Instructor:_____

There are 12 problems on 10 pages (including the cover page) worth a total of 140 points. You start with 10 points. Unless otherwise specified, each part of a problem is worth the same number of points.

You may use a calculator if you wish.

To receive full credit for a problem, you must *give an exact answer* unless otherwise specified. To receive partial credit on a problem, you must *show your work and all important steps.* No credit will be given for an answer if no work is shown.

1.	_____
2.	_____
3.	_____
4.	_____
5.	_____
6.	_____
7.	_____
8.	_____
9.	_____
10.	_____
11.	_____
12.	_____
+	10
Total	_____

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1. (15 points) Evaluate the integral:

$$\int_1^4 e^{\sqrt{x}}\, dx.$$

2. (10 points) Find $\lim_{x\to\infty} \left(\frac{x+1}{x}\right)^{4x}$.

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3. (10 points) Find the centroid of the region enclosed by the graphs of $y = 4$ and $y = x^2$.

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4. (15 points) Solve the initial value problem:

$$(1 + x^2)y' + xy^2 = x, \qquad y(0) = 0.$$

Hint: This is a separable equation.

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5. (10 points) A bacteria culture starts with 600 bacteria and grows at a rate proportional to its size. If after 3 hours there are 12,000 bacteria, how long will it take until the population reaches 45,000.

6. (10 points) For which $p > 0$ is the series

$$\sum_{n=1}^{\infty} \frac{2 + e^{-n}}{n^p}$$

convergent? For which is it divergent? Justify your answer.

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7. (10 points) Use the integral test to examine the series

$$\sum_{n=2}^{\infty} \frac{1}{n(\ln n)^3}$$

for convergence or divergence.

8. (10 points) Find the radius of convergence and the interval of convergence of the power series $\sum_{n=1}^{\infty} \frac{x^n}{n^5}$.

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9. (15 points)

(a) Find the Maclaurin series of $f(x) = x^2 \cos x$.

(b) Find $f^{(2002)}(0)$.

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10. (15 points)

(a) Find a power series for $\int_0^x e^{-t^2}\,dt$.

(b) Evaluate $\int_0^1 e^{-t^2}\,dt$ with an error less than 10^{-2}.

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11. (10 points) Consider the parametric curve $x = 2\cos t,\ y = 3\sin t,\ 0 \leq t \leq \pi$.

(a) Sketch this curve.

(b) Set up an integral to compute the length of this curve. Do **NOT** evaluate the integral.

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12. (10 points) Find the area of the region that lies inside the curve $r = 2 - 2\cos\theta$ but outside the curve $r = 2$.