*Last name:*_____ *First name:*_____

PLEASE READ THIS BEFORE YOU DO ANYTHING ELSE!

1. Make sure that your exam contains 7 pages, including this one.
2. **NO** calculators, books, notes or other written material allowed.
3. Express all numbers in exact arithmetic, i.e., no decimal approximations.
4. Read the statement below and sign your name.

   I affirm that I neither will give nor receive unauthorized assistance on this examination. All the work that appears on the following pages is entirely my own.

   Signature: _____

1. Suppose you want to deposit $\$1,000$ into a savings account and leave it in there for 10 years. If the interest rate is 6% and is compounded bi-monthly, what is the balance after 10 years. Suppose the interest rate is compounded continuously, what is the balance after 10 years.

2. Let $f(x) = x \ln x + e^{x^2}$. The point $(1, e)$ lies on the graph of $f(x)$. Find the equation of the tangent line to the curve $f(x)$ at the point $(1, e)$.

3. Find the derivative of the following functions:

(a) $\ln\left(\frac{4x^4+2x^2}{x}\right)$

(b) 4^x

(c) $\log_4\left(x^3+x^2\right)$

(d) $\left[e^{(x^3-\sin^2 x)}e^{(1-x^3)}\right]^{\frac{1}{2}}$

(e) x^{e^x}

4. Let

$$xe^x y + x \ln(y+1) = 0$$

Find $\frac{dy}{dx}$. You do not need to simplify.

5. Find $F(x)$ when

$$F''(x) = (x-1)^2 + 2x + 1$$
$$F'(0) = 0$$
$$F(0) = 1$$

6. Find the indefinite integrals.

(a)

$$\int 9x^8 + 10x(1+x^2)^4 - 3x^{1/3}\ dx$$

(b)

$$\int \frac{x^4 + x^3 - x^2}{x^2}\ dx$$

(c)

$$\int \frac{-3}{(2t+3)^2}\ dt$$

7. Sketch the graph of the function:

$$f(x) = \frac{\ln x}{x}$$

8. Because of a slump in the economy, a company finds that its annual profits have dropped from $\$742,000$ in 1998 to $\$632,000$ in 2000. If the profit follows an exponential pattern of decline, what is the expected profit for 2003?