HOMEWORK 7 - MATH 151 DUE DATE: Tuesday, April 8 INSTRUCTOR: George Voutsadakis

Read each problem **very carefully** before starting to solve it. Two out of the eight problems will be chosen at random and graded. Each problem graded will offer you 5 bonus (extra) points towards your class average. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

- 1. Find the derivatives of the following functions:
 - (a) $f(x) = x^3 e^{x^2}$ (b) $f(x) = \frac{(e^x)^2}{x}$ (c) $f(x) = x^2 \ln (x^2 + 1)$
- 2. Find an equation of the tangent line to the graph of each function at the given point:

(a)
$$f(x) = \ln(3x)$$
 at $(1,0)$.

(b)
$$f(x) = e^{-x^2}$$
 at $(1, \frac{1}{e})$.

- 3. Find the first and the second derivative of each function
 - (a) $f(x) = \frac{x}{x^2 4}$ (b) $f(x) = xe^x$ (c) $f(x) = x^2 \ln x$
- 4. Find the 31st derivative of the function $f(x) = e^{2x}$.
- 5. A ball is thrown upward. The heights in feet of the ball is given by $s(t) = 100t 16t^2$, where t is the time elapsed in seconds.
 - (a) At what time does the ball strike the ground?
 - (b) What is the velocity of the ball when it hits the ground?
 - (c) At what time does the ball reach its highest point?
- 6. Find $\frac{dy}{dx}$ using implicit differentiation:
 - (a) $x^2y + xy^2 = x + 1$

(b)
$$x^2 + y^2 = 2ye^x$$

- (c) $x = \ln(x^2 + y^2)$
- 7. Write an equation for the tangent line to the graph of $x^2 y^2 = 8$ at the point (3, 1).
- 8. Find those points (x, y), if there are any, where the tangent line to the graph of $xy + y^2 x^2 = 4x$ is horizontal.