HOMEWORK 6 - MATH 112 DUE DATE: Monday, March 15 INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. One part of each problem will be chosen at random and graded. Each question is worth 1 point. It is necessary to show your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

- 1. Compute the following derivatives
 - (a) $f(x) = e^{-\frac{1}{x^2}}$ (b) $f(x) = 4x^3 e^{-x}$ (c) $f(x) = \frac{(e^x + e^{-x})^5}{3}$ (d) $f(x) = x^2 e^x - 2x e^x + 2e^x$
- 2. Find the equation of the tangent line to
 - (a) $f(x) = x^2 e^{-x}$ at $(2, \frac{4}{e^2})$ (b) $f(x) = (e^{4x} - 2)^2$ at (0, 1)
- 3. Use implicit differentiation to compute the derivative $\frac{dy}{dx}$.
 - (a) $xe^{x} + 2ye^{x} = 0$ (b) $e^{xy} + x^{2} - y^{2} = 10$
- 4. Find the domain and then roughly sketch the graph of
 - (a) $f(x) = \log_2 (x+2)$ (b) $f(x) = \ln (2x-1)$
- 5. Expand or condense the following expressions as appropriate:
 - (a) $\ln \frac{3x(x+5)}{(5x+7)^2}$ (b) $\log_5 \sqrt[7]{\frac{x^9}{(x+4)^2}}$ (c) $\frac{1}{3} [2\ln(x+3) + \ln x - \ln(x^2 - 1)]$ (d) $\frac{1}{2} \log_{23} (x-2) + \frac{3}{2} \log_{23} (x+7)$
- 6. Solve the following equations:
 - (a) $e^{\ln (x^2)} 25 = 0$ (b) $4e^{3x-1} - 1 = 5$ (c) $\frac{36}{1+e^{-x}} = 20$
- 7. Find the derivatives:
 - (a) $f(x) = \ln(1 x^2)$
 - (b) $f(x) = \ln(\frac{x}{x^2 1})$

- (c) $f(x) = \ln (x\sqrt{4 + x^2})$ (d) $f(x) = 4^{2x-3}$ (e) $f(x) = \log_3 (x^2 + 5x)$
- 8. Use implicit differentiation to find $\frac{dy}{dx}$:
 - (a) $\ln(xy) + 5x = 30$
 - (b) $4xy + \ln(x^2y) = 7$
 - (c) $4x^3 + \ln(y^2) + 2y = 2x$