## PRACTICE EXAM 3 - MATH 112

DATE: Tuesday, November 1 INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. Each question is worth 3 points. It is necessary to show your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

- 1. (a) Use the values at x = -1, 0, 1 to roughly sketch the graph of the function  $f(x) = 3^x$ .
  - (b) Use graphing techniques to obtain the graph of  $g(x) = 3^{-(x+1)} 2$  from the graph of f of the previous part.
- 2. Find the derivatives of
  - (a)  $f(x) = 4x^3 e^{-x}$
  - (b)  $g(x) = \frac{(e^x + e^{-x})^4}{2}$
- 3. Use implicit differentiation to find the equation of the tangent line to the graph of  $xe^x + 2ye^x = 0$  at the point (4, -2).
- 4. Find the following derivatives:
  - (a)  $f(x) = \ln \frac{x}{x+1}$ (b)  $g(x) = \frac{\ln x}{x^2+1}$ (c)  $h(x) = (\ln (x^2))^2$
- 5. Solve the following equations:
  - (a)  $\frac{1}{27}3^{-x+1} = 9^{2x} \cdot 81$
  - (b)  $\log_2 x \log_2 (x 1) = 4$
  - (c)  $2e^{-x+1} 5 = 9$
- 6. Study (find the domain, the monotonicity and the concavity and roughly sketch the graph) the function  $f(x) = x \ln x$ .