

## HOMEWORK 5 - MATH 112

DUE DATE: Monday, March 7

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. Use your basic knowledge of exponential functions and your graphing techniques (shifts and reflections) to plot the graph of the exponential function  $f(x) = -3^{x-2}$ . (Detail me on the transformations used.)
2. Solve the following exponential equations
  - (a)  $(\frac{1}{5})^{2x-1} = 125$
  - (b)  $(x + 3)^{5/4} = 32$
3. Use your compound interest formula to find how much should be invested today by your parents so that they will have \$30,000 in 8 years for your little brother's college tuition, if the bank offers interest rate 4% compounded quarterly.
4. Suppose that an investment grew exponentially from \$1,000 at time  $t = 0$  to \$1,400 in 5 years. Create an exponential model  $f(t) = y_0b^t$  showing the value  $f(t)$  of the investment at time  $t$ .
5. Find the derivatives
  - (a)  $f(x) = 4x^3e^{-x}$
  - (b)  $f(x) = \frac{5}{(e^x + e^{-x})^3}$
6. Determine the equation of the tangent line to the graph of
  - (a)  $f(x) = \frac{x}{e^{2x}}$  at  $(1, \frac{1}{e^2})$
  - (b)  $e^{xy} + x^2 - y^2 = 10$  at  $(3, 0)$ .
7. Completely study (domain, intercepts, asymptotes, monotonicity, extrema, concavity, inflection points, graph) the graph of the function  $f(x) = xe^{-x}$ .
8. The Ebbinghaus Model for human memory is  $p(t) = (100 - a)e^{-bt} + a$  where  $p(t)$  is the percent retained after  $t$  weeks. (The constants  $a$  and  $b$  vary from one person to another.) If  $a = 20$  and  $b = 0.5$ , at what rate is information being retained after 1 week?