

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 $f(t) = y_0 b^t$ showing the value $f(t)$ of the investment at time t .
5. Find the derivatives
 - (a) $f(x) = 4x^3 e^{-x}$
 - (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 $f(x) = x e^{-x}$.
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?