HOMEWORK 2 - MATH 112
DUE DATE: Tuesday, January 30
INSTRUCTOR: George Voutsadakis

Read each problem **very carefully** before starting to solve it. Four out of the eight problems will be chosen at random and graded. Each problem graded is worth 3 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Use the limit definition to find the derivative of the functions
   (a) $f(x) = \sqrt{x-1}$
   (b) $g(x) = \frac{1}{x-3}$.
2. Use the definition of the derivative to find the slope of the tangent line to the graph of the following function at the indicated point:
   (a) $f(x) = x^2 - 2$ at $(2, 2)$.
   (b) $g(x) = \sqrt{x+2}$ at $(7, 3)$.
3. Use the basic rules for derivatives to compute the derivatives of the following functions:
   (a) $f(x) = x^3 - 2x + 4$
   (b) $g(x) = \frac{4}{x^2} + 5x^7$
   (c) $h(x) = 7\sqrt[5]{x^3} + 2\sqrt[7]{x^5}$
4. Find the value of the derivative at the given point:
   (a) $f(x) = 3x(x^2 - \frac{2}{x})$
   (b) $g(x) = 3(5-x)^2$
   (c) $h(x) = \frac{2x^3 - 4x^2 + 3}{x^2}$
5. Find the slope of the tangent line to the function $f(x) = \sqrt[5]{x} + \sqrt[9]{x}$ at the point $(1, 2)$.
6. The height s in feet of an object fired straight up from ground level with an initial velocity of 200 feet per second is given by $s(t) = -16t^2 + 200t$, where t is the time in seconds.
   (a) How fast is the object moving after 1 second?
   (b) When will the object reach its maximum height and what will that maximum height be?
   (c) When will the object hit the ground?
   (d) During which interval of time is the speed decreasing?
7. Suppose that the rental price of an apartment, when x apartments are rented, is $p(x) = 2(900 + 32x - x^2)$. Find the marginal revenue when 14 apartments are rented.
8. The demand function for a product is $p(x) = \frac{50}{\sqrt{x}}$, for $1 \leq x \leq 8000$, and the cost function is $C(x) = \frac{1}{2}x + 500$, for $0 \leq x \leq 8000$. Find the marginal profit function for the sales of this product.