

# HOMEWORK 6 - MATH 151

DUE DATE: Monday, March 24

INSTRUCTOR: George Voutsadakis

Read each problem **very carefully** before starting to solve it. Two out of the eight problems will be chosen at random and graded. Each problem graded will offer you 5 bonus (extra) points towards your class average. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Find the derivative of each function at the given point **using the limit definition**.
  - (a)  $f(x) = 3x^2 - 4x$  at  $a = 2$ .
  - (b)  $f(x) = \frac{1}{x^2}$  at  $a = 1$ .
2. The cost function for a certain production facility is  $C(x) = x + 5$  and the revenue function is  $R(x) = 12x - 2x^2$ , where  $x$  is the number of units produced in thousands and  $R$  and  $C$  are measured in millions of dollars. Find the marginal revenue and the marginal cost functions using the limit definition of the derivative. How many units should be produced for the marginal cost to equal the marginal revenue?
3. Compute the derivatives of the functions
  - (a)  $f(x) = \frac{1}{2}x^8 + 3x + \frac{2}{3}$
  - (b)  $f(x) = 8x^3 - 6x^2 + 2x$
4. Find the value of  $\frac{dy}{dx}$  at the indicated point.
  - (a)  $y = x^2 - 3x$  at  $(-1, 4)$ .
  - (b)  $y = x^3 - x^2$  at  $(1, 0)$ .
5. Two lines through the point  $(1, -3)$  are tangent to the graph of the function  $y = 2x^2 - 4x + 1$ . Find the equations of these two lines.
6. Use the product formula to compute the derivatives of the functions
  - (a)  $f(x) = (x^3 - 3)(x^2 + 4)$ .
  - (b)  $f(x) = (x^6 - 2)(4x^2 + 1)$ .
7. Use the quotient rule to find the derivatives of the functions:
  - (a)  $f(x) = \frac{2x^2-1}{5x+2}$ .
  - (b)  $f(x) = 1 - \frac{1}{x} + \frac{1}{x^2}$ .
8. Find an equation for the tangent line to the graph of  $y = \frac{x^2}{x-1}$  at the point  $(-1, -\frac{1}{2})$ .