HOMEWORK 3 - MATH 160
DUE DATE: Tuesday, September 15
INSTRUCTOR: George Voutsadakis

Read each problem **very carefully** before starting to solve it. Two out of the ten problems will be chosen at random and graded for a total of 20 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. A manufacturer has a monthly fixed cost of $ 70,000 and a production cost of $ 8 for each unit produced. The product sells for $ 15 per unit. Suppose x denotes the number of units produced and sold. Find

   (a) the cost function $C(x)$;

   (b) the revenue function $R(x)$;

   (c) the profit function $P(x)$;

   (d) the number of units that need to be sold to break even.

2. Suppose an asset has an initial value of $ 100,000 and is to be depreciated **linearly** over 5 years with a scrap value of $ 30,000. What is the book value of this asset at the end of the second year? (Please explain your answer carefully.)

3. Jane wants to have a rectangular shaped garden in her backyard with an area of 250 ft^2. Letting x denote the width of her garden, find a function f in the variable x (only) giving the length of the fencing required to construct the garden. What is the domain of f?

4. By cutting away identical squares from each corner of a rectangular piece of cardboard and folding up the resulting flaps, an open box may be made. If the cardboard is 15 in. long and 8 in. wide and the square cutaways have dimensions of x in. by x in., find a function in the variable x (only) giving the volume of the resulting box.

5. Sketch the graph of $f(x) = \begin{cases} x, & \text{if } x < 1 \\ 0, & \text{if } x = 1 \\ -x + 2, & \text{if } x > 1 \end{cases}$ and find $\lim_{x \to 1} f(x)$ if it exists.

6. Find the limits   (a) $\lim_{x \to 1} (2x^3 - 3x^2 + 2)$ (b) $\lim_{x \to 1} \frac{x^3 + 1}{2x^3 + 2}$

7. If $\lim_{x \to a} f(x) = 3$ and $\lim_{x \to a} g(x) = 4$, then compute
   (a) $\lim_{x \to a} [f(x)g(x)]$ (b) $\lim_{x \to a} \frac{g(x) - f(x)}{f(x) + \sqrt{g(x)}}$

8. Find the following limits, if they exist:
   (a) $\lim_{x \to 0} \frac{2x^2 - 3x}{x}$ (b) $\lim_{x \to -5} \frac{x^2 - 25}{x + 5}$ (c) $\lim_{x \to 4} \frac{x - 4}{\sqrt{x} - 2}$

9. Find the following limits, if they exist:
   (a) $\lim_{x \to -\infty} \frac{4x^2 - 1}{x + 2}$ (b) $\lim_{x \to \infty} \frac{2x^2 + 3x + 1}{5x^2 - x}$ (c) $\lim_{x \to \infty} \frac{2x^2 - 1}{x^3 + x^2 + 1}$

10. No tenth problem this week!