EXAM 1 - MATH 112 Friday, February 7

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Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. (a) A line ℓ has equation $3x + 5y = 7$. A line ℓ' passes through the points $(1, -21)$ and $(10, -36)$. Show all your work in answering the following questions.

   (i) Find the slope of ℓ.

   (ii) Find the slope of ℓ'.

   (iii) Tell whether ℓ and ℓ' are parallel, perpendicular or neither and explain.

   (b) Find the domain of the function $f(x) = \dfrac{x+7}{3x^3 + 2x^2 - 5x}$.

2. A certain manufacturer has fixed costs \$3200 and variable costs \$100 per each item produced. Suppose its revenue function is $R(x) = -2x^2 + 300x$, where x is the number of items produced and sold.

   (a) Find the cost function $C(x)$.

   (b) Find the break-even point(s).

   (c) Find an equation for the profit function $P(x)$.

   (d) Find the number of items that need to be produced to maximize the profit. Explain your work.

3. Compute the difference quotient of $f(x) = x^2 + 7x$ at x and simplify.

4. The position function of a moving object at time t in seconds is given by $s(t) = \sqrt{2t-1}$ in meters. Find the instantaneous velocity of the object at time $t = 5$ seconds.

5. Consider the piece-wise defined function

$$f(x) = \begin{cases} \dfrac{x^2 - 7x + 10}{x - 2}, & \text{if } x < 2 \\ -3, & \text{if } x = 2 \\ \dfrac{\frac{1}{x} - \frac{1}{2}}{x - 2}, & \text{if } x > 2 \end{cases} .$$

Calculate the following:

$f(2) =$

$\lim_{x \to 2^-} f(x) =$

$\lim_{x \to 2^+} f(x) =$

$\lim_{x \to 2} f(x) =$

State the type of continuity of f at $x = 2$, if any.