

YOUR NAME: \_\_\_\_\_

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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. Graph the piece-wise defined function  $f(x) = \begin{cases} x + 2, & \text{if } x < -1 \\ 1, & \text{if } -1 < x < 1 \\ -x^2 + 6x - 7, & \text{if } x \geq 1 \end{cases}$

2. A company producing a certain type of electronic gadget has cost function  $C(x) = x^2 - 30x + 1200$  and revenue function  $R(x) = 50x$ , where  $x$  is the number of gadgets produced.

(a) How many gadgets must be produced for the company to break-even?

(b) Which production level maximized the company's profit?

3. Compute the following limits:

(a)  $\lim_{x \rightarrow 17} \sqrt{81 - x} =$

(b)  $\lim_{x \rightarrow -3} \frac{x + 3}{2 - \sqrt{x + 7}} =$

(c)  $\lim_{x \rightarrow 5} \frac{\frac{1}{7} - \frac{1}{x+2}}{x - 5} =$

4. Consider the function  $f(x) = \begin{cases} \frac{x^2 - 8x + 15}{x^2 - 12x + 27}, & \text{if } x < 3 \\ \frac{1}{3}, & \text{if } x = 3 \\ \frac{\sqrt{7x - 5} - 4}{x - 3}, & \text{if } x > 3 \end{cases}$ .

Find the following:

$$f(3) =$$

$$\lim_{x \rightarrow 3^-} f(x) =$$

$$\lim_{x \rightarrow 3^+} f(x) =$$

Circle all that apply:

At  $x = 3$ ,  $f(x)$  has a limit  is left continuous  is right-continuous  is continuous.

5. Use the limit definition of the derivative to find an equation of the tangent line to the graph of the following function at  $x = 2$ :

$$f(x) = -3x^2 + x.$$