

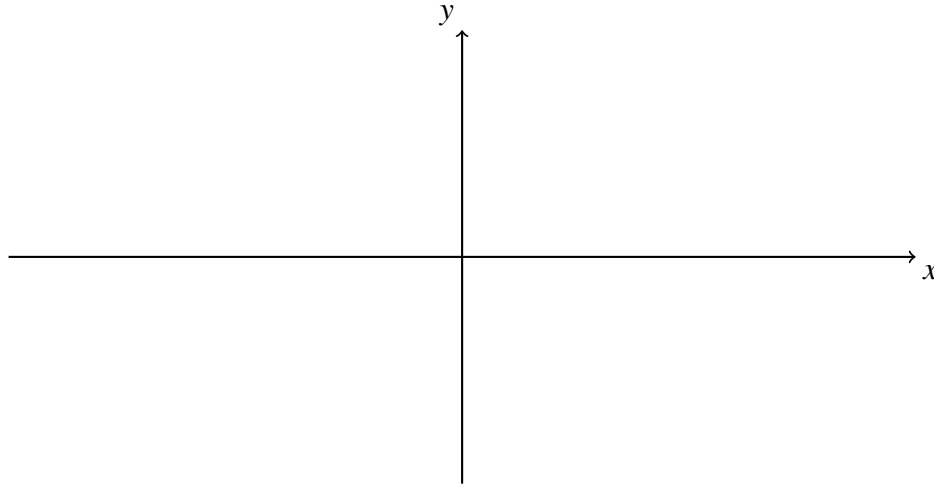
Name: _____

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20 points possible. No aids (book, calculator, etc.) are permitted. Show all work for full credit.

1. [6 points] Consider the function $f(x) = \begin{cases} 1 + 2x & \text{if } x < 0 \\ -1 & \text{if } x = 0 \\ 1 - x^2 & \text{if } x > 0 \end{cases}$.

a. On the axes below, sketch a graph of $f(x)$.



b. Evaluate (**with justification**) the limit, or explain why it does not exist:

$$\lim_{x \rightarrow 0} f(x)$$

c. Is f continuous at $x = 0$? Explain using the **definition** of continuity.

2. [4 points] Use the Intermediate Value Theorem to show that there is a root of the equation $x - 2 \cos(x) + 1 = 0$ in the interval $(0, \pi)$.

3. [6 points] Evaluate the limit. Show work and use proper limit notation for full credit.

$$\lim_{h \rightarrow 0} \frac{\frac{1}{5+h} - \frac{1}{5}}{h}$$

4. [4 points]

a. Why is the following not, strictly speaking, a fully true statement?:

$$\frac{(x-1)(x+2)}{x-1} = x+2$$

b. Carefully sketch the graph of $f(x) = \frac{(x-1)(x+2)}{x-1}$ on the interval $[0, 2]$.

