Worksheet 7: Continuity!

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1. Find the numbers at which f is discontinuous. At which of these numbers is f continuous from the right, from the left, or neither.

$$f(x) = \begin{cases} x+1 & : x \leq 1 \\ \frac{1}{x} & : 1 < x < 3 \\ \sqrt{x-3} & : x \geq 3 \end{cases}$$

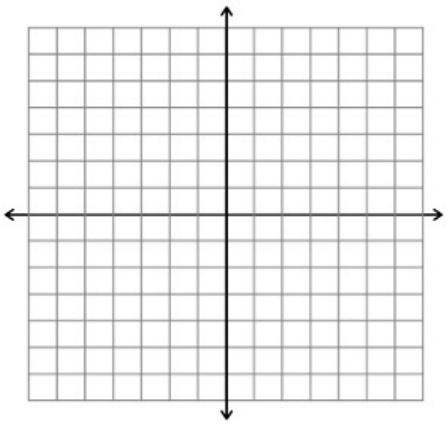
2. Use the intermediate value theorem to show that there is a root of $f(x) = -e^x + 3 - 2x$ in the interval $(0, 1)$.

3. Find a constant c such that

$$g(x) = \begin{cases} x^2 - c^2 & : x < 4 \\ cx + 20 & : x \geq 4 \end{cases}$$

is continuous.

4. Sketch a function $f(x)$ such that $\lim_{x \to 3} f(x) = -\infty$, $\lim_{x \to \infty} f(x) = 2$, $f(0) = 0$, and f is even.



5. Evaluate $\lim_{x\to\infty} \dfrac{3x^2 - x - 2}{5x^2 + 4x + 1}$

6. Evaluate $\lim_{x\to\infty} \sqrt{x^2 - 3} - x$