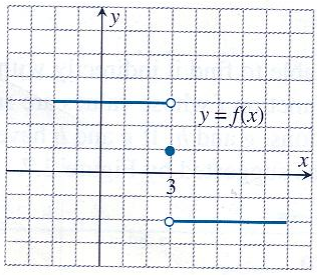
Checkup2B
Name: _____

- Find limits graphically
- Find limits numerically
- Find limits analytically: substitution, simplification & sandwich theorem
- Find limits involving infinity

1. Use the graph to estimate the limits and value of the function, or explain why the limits do not exist.



(a) $\lim_{x\to 3^-} f(x)$ **(b)** $\lim_{x\to 3^+} f(x)$ **(c)** $\lim_{x\to 3} f(x)$ **(d)** $f(3)$

2. Answer the questions for the piecewise-defined function.

$$f(x) = \begin{cases} 1, & x \le -1 \\ -x, & -1 < x < 0 \\ 1, & x = 0 \\ -x, & 0 < x < 1 \\ 1, & x \ge 1 \end{cases}$$

(a) Find the right-hand and left-hand limits of f at $x = -1$, 0, and 1.

(b) Does f have a limit as x approaches -1? 0? 1? If so, what is it? If not, why not?

3. Find the limit analytically (using algebra), be sure to show all of your work.

$$\lim_{x\to -1} \frac{x^2 - 5x - 6}{x + 1}$$

4. Explain how the sandwich theorem allows you to show that: $\lim_{x\to 0} x^2 \sin\left(\frac{1}{x}\right) = 0$

5. Find the vertical asymptotes of the graph of f(x) and describe the behavior of f(x) to the left and right of each vertical asymptote using limit notation. $f(x) = \frac{1}{x^2 - 4}$