

Name: \_\_\_\_\_

## Limits

**Exercise 1:** Fill in the given table and use it to find  $\lim_{x \rightarrow 2} f(x)$ .

|                            |      |       |        |   |        |       |      |
|----------------------------|------|-------|--------|---|--------|-------|------|
| $x$                        | 1.99 | 1.999 | 1.9999 | 2 | 2.0001 | 2.001 | 2.01 |
| $f(x) = \frac{ x-2 }{x-2}$ |      |       |        | ? |        |       |      |

**Exercise 2:** Fill in the given table and use it to find  $\lim_{x \rightarrow 0} g(x)$ .

|   |       |        |         |   |        |       |      |
|---|-------|--------|---------|---|--------|-------|------|
| $x$   | -0.01 | -0.001 | -0.0001 | 0 | 0.0001 | 0.001 | 0.01 |
| $g(x) = \begin{cases} x+1, & x < 0 \\ 3, & x = 0 \\ x^2+1, & x > 0 \end{cases}$ |       |        |         | ? |        |       |      |

**Exercise 3:** Let  $\lim_{x \rightarrow c} f(x) = 3$  and  $\lim_{x \rightarrow c} g(x) = 2$ . Find:

- 1)  $\lim_{x \rightarrow c} [f(x) - g(x)]$
- 2)  $\lim_{x \rightarrow c} [10g(x)]$
- 3)  $\lim_{x \rightarrow c} [4f(x) - 5g(x)]$
- 4)  $\lim_{x \rightarrow c} [f(x) \cdot g(x)]$
- 5)  $\lim_{x \rightarrow c} \left[ \frac{f(x)}{g(x)} \right]$
- 6)  $\lim_{x \rightarrow c} \left[ \frac{2f(x)}{5g(x)} \right]$
- 7)  $\lim_{x \rightarrow c} [f(x)]^3$
- 8)  $\lim_{x \rightarrow c} \left[ \frac{g(x)}{4} \right]^4$
- 9)  $\lim_{x \rightarrow c} \sqrt[3]{\frac{f(x)}{g(x)}}$
- 10)  $\lim_{x \rightarrow c} \sqrt[3]{15g(x)}$

**Exercise 4:** Evaluate each of the following limits, if it exists:

1)  $\lim_{x \rightarrow -2} (x + 5)$

2)  $\lim_{k \rightarrow 0} (4k + k^3)$

3)  $\lim_{x \rightarrow 2} \left( \frac{4x - 3}{5x + 2} \right)$

4)  $\lim_{x \rightarrow -4} \left( \frac{x^2 - 16}{x + 4} \right)$

5)  $\lim_{x \rightarrow 1} \left( \frac{x^2 + 4x - 5}{x + 1} \right)$

6)  $\lim_{x \rightarrow -3} \left( \frac{x + 3}{x^3 + 27} \right)$

7)  $\lim_{x \rightarrow 3} \left( \frac{x^3 - 27}{9 - x^2} \right)$

8)  $\lim_{x \rightarrow 0} \left( \frac{x^3 - 4x^2 - 8x}{2x} \right)$

9)  $\lim_{x \rightarrow 0} \left( \frac{\frac{1}{x+2} - \frac{1}{2}}{2x} \right)$

10)  $\lim_{x \rightarrow 0} \left( \frac{\sqrt{x+9} - 3}{x} \right)$

11)  $\lim_{x \rightarrow 1} \left( \frac{\sqrt{x} - 1}{x^2 - 1} \right)$

12)  $\lim_{x \rightarrow 2} \left( \frac{\sqrt{x-2}}{x^2 - 4} \right)$

13)  $\lim_{y \rightarrow 8} \left( \frac{y - 8}{\sqrt[3]{y} - 2} \right)$

14)  $\lim_{h \rightarrow 0} \left( \frac{4 - \sqrt{16+h}}{h} \right)$

**Exercise 5:** Evaluate  $\lim_{x \rightarrow 0} f(x)$  where:

$$f(x) = \begin{cases} 5x & x \neq 0 \\ 3 & x = 0 \end{cases}$$

**Exercise 6:** Evaluate  $\lim_{t \rightarrow 5} f(t)$  where:

$$f(t) = \begin{cases} 2t^2 & t \geq 5 \\ 2 - t & t < 5 \end{cases}$$

**Exercise 7:** Evaluate  $\lim_{x \rightarrow 2} f(x)$  where:

$$f(x) = \begin{cases} \frac{x^2 - 4}{3x - 6} & x \neq 2 \\ \frac{2}{3}x & x = 2 \end{cases}$$