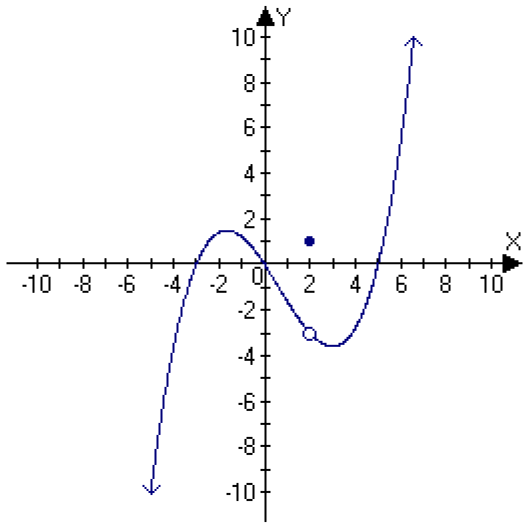
Review Exercise Set 2

Exercise 1: Use the graph of the function f(x) below to determine whether the given limit exists. If the limit does exist, find its value.



$$\lim_{x\to 2} f(x) =$$

Exercise 2: Use the same graph from Exercise 1 to determine whether the given limit exists. If the limit does exist, find its value.

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

Exercise 3: Use the properties of limits to find the following limit given that

$$\lim_{x\to 1} f(x) = 12 \quad \text{and} \quad \lim_{x\to 1} g(x) = 3$$

$$\lim_{x\to 1} \frac{\left[f(x)\times g(x)\right]}{6+g(x)} =$$

Exercise 4: Use the properties of limits to decide whether the following limit exists. If it exists, what is its value?

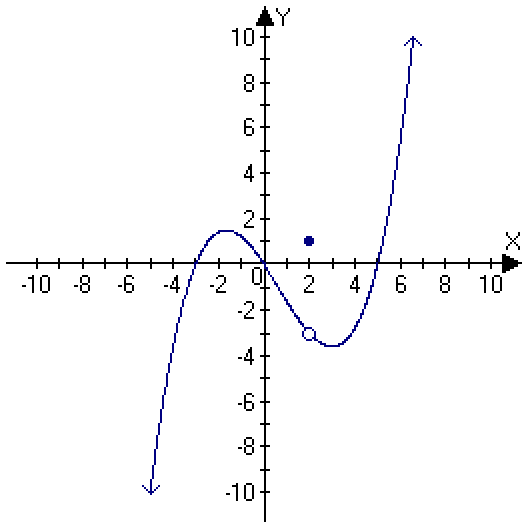
$$\lim_{x \to -3} \frac{x^2 + x - 6}{x^2 - 2x - 15} =$$

Exercise 5: Use the properties of limits to decide whether the following limit exists. If it exists, what is its value?

$$\lim_{x \to \infty} \frac{3x}{x^2 - 4x} =$$

Review Exercise Set 2 Answer Key

Exercise 1: Use the graph of the function f(x) below to determine whether the given limit exists. If the limit does exist, find its value.



$$\lim_{x \to 2} f(x) = -3$$

As x approaches 2 from either side, y approaches the value of -3.

Exercise 2: Use the same graph from Exercise 1 to determine whether the given limit exists. If the limit does exist, find its value.

$$\lim_{x \to -3} f(x) = 0$$

As x approaches -3 from either side, y approaches the value of 0.

Exercise 3: Use the properties of limits to find the following limit given that

$$\lim_{x \to 1} f(x) = 12 \quad \text{and} \quad \lim_{x \to 1} g(x) = 3$$

$$\lim_{x \to 1} \frac{\left[f(x) \times g(x)\right]}{6 + g(x)} = \frac{\lim_{x \to 1}\left[f(x) \times g(x)\right]}{\lim_{x \to 1}\left[6 + g(x)\right]}$$

$$= \frac{\left[\lim_{x \to 1} f(x)\right] \times \left[\lim_{x \to 1} g(x)\right]}{\left[\lim_{x \to 1} 6\right] + \left[\lim_{x \to 1} g(x)\right]}$$

$$= \frac{(12)(3)}{6+3}$$

$$= \frac{36}{9}$$

$$= 4$$

Exercise 4: Use the properties of limits to decide whether the following limit exists. If it exists, what is its value?

$$\lim_{x \to -3} \frac{x^2 + x - 6}{x^2 - 2x - 15} = \frac{(-3)^2 + (-3) - 6}{(-3)^2 - 2(-3) - 15}$$

$$= \frac{9 - 3 - 6}{9 + 6 - 15}$$

$$= \frac{0}{0}$$

Since this is an indeterminate form, we must factor the expression before evaluating it.

$$\lim_{x \to -3} \frac{x^2 + x - 6}{x^2 - 2x - 15} = \lim_{x \to -3} \frac{(x-2)(x+3)}{(x-5)(x+3)}$$

$$= \lim_{x \to -3} \frac{x-2}{x-5}$$

$$= \frac{-3-2}{-3-5}$$

$$= \frac{-5}{-8}$$

$$= \frac{5}{8}$$

Exercise 5: Use the properties of limits to decide whether the following limit exists. If it exists, what is its value?

$$\lim_{x\to\infty}\frac{3x}{x^2-4x}=\lim_{x\to\infty}\frac{\frac{3x}{x^2}}{\frac{x^2}{x^2}-\frac{4x}{x^2}}$$

$$=\lim_{x\to\infty}\frac{\frac{3}{x}}{1-\frac{4}{x}}$$

$$=\frac{\lim_{x\to\infty}\frac{3}{x}}{\lim_{x\to\infty}\left(1-\frac{4}{x}\right)}$$

$$=\frac{\lim_{x\to\infty}\frac{3}{x}}{\lim_{x\to\infty}1-\lim_{x\to\infty}\frac{4}{x}}$$

$$=\frac{0}{1-0}$$

$$=0$$