If $f(x) = \dfrac{x^2 - 4}{x - 2}$ and $g(x) = x + 2$, then we can say the functions f and g are equal.

$$\lim_{x\to 2} f(x) = 4 \quad \lim_{x\to 2} g(x) = -2 \quad \lim_{x\to 2} h(x) = 0$$

Find the limits, if they exist:

(a) $\lim_{x\to 2}[f(x) + 5g(x)]$

(b) $\lim_{x\to 2}[g(x)]^3$

(c) $\lim_{x\to 2} \frac{1}{f(x)}$

(d) $\lim_{x\to 2} 4f(x)g(x)$

(e) $\lim_{x\to 2} \frac{g(x)}{h(x)}$

(f) $\lim_{x\to 2} \frac{g(x)h(x)}{f(x)}$

$$\lim_{x\to 1} \frac{x^2 - 4x + 3}{x - 1}$$

$$\lim_{h\to 0} \frac{\sqrt{9 + h} - 3}{h}$$

$$\lim_{x\to -1} \frac{x^2 - 4x}{x^2 - 3x - 4}$$

$$\lim_{x\to -4} \frac{1/4 + 1/x}{4 + x}$$

$$\lim_{h\to 0} \frac{(-4 + h)^2 - 16}{h}$$

$$\lim_{x\to 0} \frac{9}{t} - \frac{9}{t^2 + t}$$

True or **False**.

Consider a function $f(x)$ with the property that $\lim_{x \to a} f(x) = 0$. Now consider another function $g(x)$ also defined near a. Then

$$\lim_{x \to a} [f(x)g(x)] = 0$$

True or **False**.

If $\lim_{x \to a} f(x) = \infty$ and $\lim_{x \to a} g(x) = \infty$, then

$$\lim_{x \to a} [f(x) - g(x)] = 0$$

Find the following limits.

$$\lim_{x \to 3} 8x + |x - 3|$$

$$\lim_{x \to -3} \frac{4x + 12}{|x + 3|}$$

If

$$2x - 2 \leq f(x) \leq x^2 - 2x + 2$$

for $x \geq 0$, find $\lim_{x \to 2} f(x)$.

Consider the function

$$f(x) = \begin{cases} x^2 & x \text{ is rational, } x \neq 0 \\ -x^2 & x \text{ is irrational} \\ \text{undefined} & x = 0 \end{cases}$$

Then

1. there is no a for which $\lim_{x \to a} f(x)$ exists
2. there may be some a for which $\lim_{x \to a} f(x)$ exists, but it is impossible to say without more information
3. $\lim_{x \to a} f(x)$ exists only when $a = 0$
4. $\lim_{x \to a} f(x)$ exists for infinitely many a