Topic: Limits of combinations

Question: If $f(x) = x - 5$ and $g(x) = 3$, evaluate the limit.

$$\lim_{x \to 2}[f(x) - g(x)]$$

Answer choices:

A $\lim_{x \to 2}[f(x) - g(x)] = 6$

B $\lim_{x \to 2}[f(x) - g(x)] = -6$

C $\lim_{x \to 2}[f(x) - g(x)] = 0$

D $\lim_{x \to 2}[f(x) - g(x)] = \infty$

Solution: B

We'll start by distributing the limit across the combination.

$$\lim_{x\to 2}[f(x) - g(x)]$$

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

$$\lim_{x\to 2}(x - 5) - \lim_{x\to 2}(3)$$

Now we'll substitute the value we're approaching into each function.

$$(2 - 5) - (3)$$

$$-3 - 3$$

$$-6$$

Topic: Limits of combinations

Question: If $f(x) = x^3$ and $g(x) = 2 - x^2$, evaluate the limit.

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

Answer choices:

A $\lim_{x \to 3} 2f(x)g(x) = 189$

B $\lim_{x \to 3} 2f(x)g(x) = -189$

C $\lim_{x \to 3} 2f(x)g(x) = 378$

D $\lim_{x \to 3} 2f(x)g(x) = -378$

Solution: D

We'll start by distributing the limit across the combination.

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

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

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

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

Now we'll substitute the value we're approaching into each function.

$$2(3^3)(2-3^2)$$

$$2(27)(-7)$$

$$-378$$

Topic: Limits of combinations

Question: If $f(x) = x^2 + 2x + 1$ and $g(x) = x - 1$, evaluate the limit.

$$\lim_{x \to -1} \frac{f(x)}{4g(x)}$$

Answer choices:

A $\lim_{x \to -1} \frac{f(x)}{4g(x)} = -\infty$

B $\lim_{x \to -1} \frac{f(x)}{4g(x)} = \infty$

C $\lim_{x \to -1} \frac{f(x)}{4g(x)} = 0$

D The limit does not exist (DNE)

Solution: C

We'll start by plugging $f(x)$ and $g(x)$ into the limit.

$$\lim_{x\to -1} \frac{f(x)}{4g(x)}$$

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

Now we'll substitute the value we're approaching into the function.

$$\frac{(-1)^2+2(-1)+1}{4(-1-1)}$$

$$\frac{1-2+1}{4(-2)}$$

$$\frac{0}{-8}$$

$$0$$