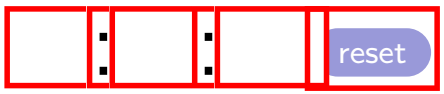
Bellwork 9/12

Evaluate without a calculator:

1. $\lim_{x \to 3^-} \left(\frac{x}{x+3} \right)$ and $\lim_{x \to 3^+} \left(\frac{x}{x+3} \right)$

2. $\lim_{x \to \pi^-} \left[\frac{\cos(x)}{\sin(x)} \right]$ and $\lim_{x \to \pi^+} \left[\frac{\cos(x)}{\sin(x)} \right]$

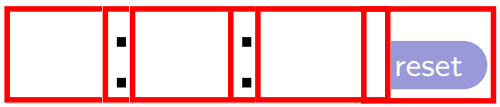


Bellwork 9/12 - Solutions

1.
   1. $\lim_{x \to 3^-} \left(\frac{x}{x+3} \right) = \frac{1}{2}$
   2. $\lim_{x \to 3^+} \left(\frac{x}{x+3} \right) = \frac{1}{2}$
2.
   1. $\lim_{x \to \pi^-} \left[\frac{\cos(x)}{\sin(x)} \right] = -\infty$
   2. $\lim_{x \to \pi^+} \left[\frac{\cos(x)}{\sin(x)} \right] = \infty$

Exercise 1

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



Exercise 1 - Solution

$$\lim_{x \to 2} \left(\frac{x+3}{x^2+x-6} \right) \quad \boxed{\text{DNE}}$$

$$\lim_{x \to 2^-} \left(\frac{x+3}{x^2+x-6} \right) = -\infty \qquad \lim_{x \to 2^+} \left(\frac{x+3}{x^2+x-6} \right) = \infty$$

Exercise 2

$$\lim_{x \to 1} \left(\frac{x - 1}{x^2 + 3x + 2} \right)$$

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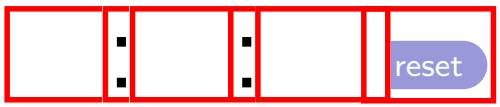
Exercise 2 - Solution

$$\lim_{x \to 1} \left(\frac{x-1}{x^2+3x+2} \right) = \boxed{0}$$

Exercise 3

$$\lim_{h \to 0} \left(\frac{\sqrt{4+h} - 2}{h} \right)$$

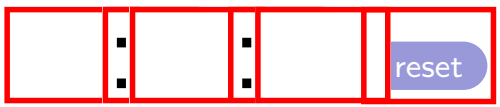


Exercise 3 - Solution

$$\lim_{h \to 0} \left(\frac{\sqrt{4+h} - 2}{h} \right) = \boxed{\frac{1}{4}}$$

Exercise 4

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



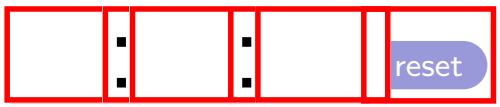
Exercise 4 - Solution

$$\lim_{h \to 0} \left[\frac{(4+h)^2 - 16}{h} \right] = \boxed{8}$$

Exercise 5

$$f(x) = \begin{cases} x + 3 & \text{if } x < 3 \\ x^2 - 2 & \text{if } x \geq 3 \end{cases}$$

Find $\lim_{x \to 3} f(x)$



Exercise 5 - Solution

$$f(x) = \begin{cases} x + 3 & \text{if } x < 3 \\ x^2 - 2 & \text{if } x \geq 3 \end{cases}$$

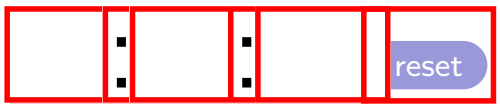
$$\lim_{x \to 3^-} f(x) = 6 \qquad \lim_{x \to 3^+} f(x) = 7$$

$$\implies \lim_{x \to 3} f(x) \boxed{\text{DNE}}$$

Exercise 6

$$g(x) = \begin{cases} \sqrt{x-2} & \text{if } x \leq 3 \\ 2x - 5 & \text{if } x > 3 \end{cases}$$

Find $\lim_{x \to 3} g(x)$



Exercise 6 - Solution

$$g(x) = \begin{cases} \sqrt{x-2} & \text{if } x \leq 3 \\ 2x - 5 & \text{if } x > 3 \end{cases}$$

$$\lim_{x \to 3^-} g(x) = 1 \qquad \lim_{x \to 3^+} g(x) = 1$$

$$\Longrightarrow \lim_{x \to 3} g(x) = \boxed{1}$$