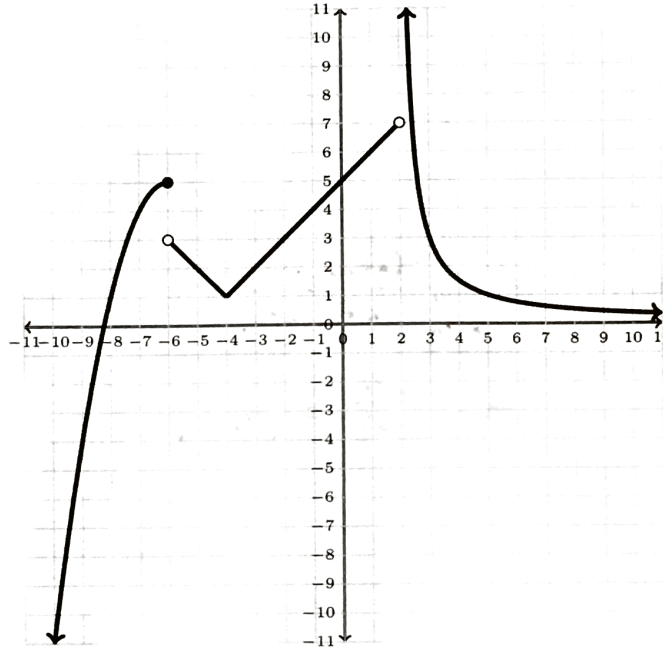


Name: Key

- Keep phones off and out sight.
- No calculators, notes, books, or other aids.
- Do not talk during the quiz.
- Show all work.

1. Shown below is the graph of a function $f(x)$. Use it to compute each limit or function value. For each limit, give a value if possible, or answer $+\infty$, $-\infty$, or "DNE."



(a) $\lim_{x \rightarrow 2^-} f(x) = \underline{7}$

(d) $\lim_{x \rightarrow -6} f(x) = \underline{\text{DNE (jump)}}$

(b) $\lim_{x \rightarrow 2^+} f(x) = \underline{\infty}$

(e) $\lim_{x \rightarrow -4} f(x) = \underline{1}$

(c) $f(-6) = \underline{5}$

(f) What is the domain of this function?
 $\underline{(-\infty, 2) \cup (2, \infty)}$

2. Compute each limit. Give a value if possible, or answer $+\infty$, $-\infty$, or "DNE."

$$(a) \lim_{x \rightarrow 1^+} \frac{x^2 - 2x + 5}{x - 1} = \frac{1 - 2 + 5}{0^+} = \frac{4}{0^+} = \boxed{+\infty}$$

$$(b) \lim_{x \rightarrow 2} \frac{x^2 - 4}{x^2 + x - 6} = \lim_{x \rightarrow 2} \frac{(x+2)(x-2)}{(x+3)(x-2)} \\ = \frac{2+2}{2+3} = \boxed{4/5}$$

$$(c) \lim_{x \rightarrow -2} \frac{|x - 2|}{x^2 + 2} = \frac{|-2 - 2|}{4 + 2} = \frac{4}{6} = \boxed{2/3}$$

$$\begin{aligned}
 \text{(d)} \quad \lim_{x \rightarrow 1} \frac{\sqrt{2x+7}-3}{x^2-x-1} \cdot \frac{\sqrt{2x+7}+3}{\sqrt{2x+7}+3} &= \lim_{x \rightarrow 1} \frac{2x+7-9}{(x+1)(x-1)(\sqrt{2x+7}+3)} \\
 &= \lim_{x \rightarrow 1} \frac{2(x-1)}{(x+1)(x-1)(\sqrt{2x+7}+3)} \\
 &= \frac{2}{2 \cdot (5+3)} = \boxed{1/6}
 \end{aligned}$$

$$\text{(e)} \quad \lim_{x \rightarrow 5} \frac{x^2 - x - 20}{|x - 5|}$$

From left:

$$\lim_{x \rightarrow 5^-} \frac{(x-5)(x+4)}{-(x-5)} = -9$$

From right:

$$\lim_{x \rightarrow 5^+} \frac{(x-5)(x+4)}{+(x-5)} = +9$$

DNE

(one-sided limits disagree).

3. Let $f(x) = \frac{1}{x^2}$. Compute and simplify $\frac{f(x+h) - f(x)}{h}$.

$$\begin{aligned}
 \frac{\frac{1}{(x+h)^2} - \frac{1}{x^2}}{h} &= \frac{x^2 - (x^2 + 2xh + h^2)}{x^2(x+h)^2 h} \\
 &= \frac{-2xh - h^2}{x^2(x+h)^2 h} \\
 &= \boxed{\frac{-2x - h}{x^2(x+h)^2}}
 \end{aligned}$$