

Name: Key Date _____

Instructions: For each question, neatly write a solution and circle your answer.

1. Let $f(x) = \begin{cases} 3x - \frac{3}{2}, & x \leq 1 \\ \frac{x^2 + 3x - 10}{x^2 + x - 6}, & x > 1 \end{cases}$. Is $f(x)$ continuous at $x = 1$? Justify your answer.

$$\textcircled{1} f(1) = 3 \cdot 1 - \frac{3}{2} = 3 - \frac{3}{2} = \frac{3}{2}$$

$$\textcircled{2} \lim_{x \rightarrow 1^-} f(x) = \lim_{x \rightarrow 1} 3x - \frac{3}{2} = 3 \cdot 1 - \frac{3}{2} = \frac{3}{2}$$

$$\lim_{x \rightarrow 1^+} f(x) = \lim_{x \rightarrow 1} \frac{x^2 + 3x - 10}{x^2 + x - 6} = \frac{1 + 3 - 10}{1 + 1 - 6} = \frac{-6}{-4} = \frac{3}{2}$$

$$\left. \begin{array}{l} \lim_{x \rightarrow 1} f(x) \\ = \frac{3}{2} \end{array} \right\} = \frac{3}{2}$$

$$\textcircled{3} f(1) \stackrel{?}{=} \lim_{x \rightarrow 1} f(x) \Rightarrow \frac{3}{2} \checkmark = \frac{3}{2} \quad \boxed{\text{Yes}}$$

2. Evaluate $\lim_{x \rightarrow \infty} \frac{x^2 - 4x + 9}{3x^2 + 7x - 3}$.

$$\lim_{x \rightarrow \infty} \frac{x^2 - 4x + 9}{3x^2 + 7x - 3} = \lim_{x \rightarrow \infty} \frac{1 - \frac{4}{x} + \frac{9}{x^2}}{3 + \frac{7}{x} - \frac{3}{x^2}}$$

$$= \frac{1 - 0 + 0}{3 + 0 - 0} = \boxed{\frac{1}{3}}$$