Computing Limits Algebraically

Polynomial	Rational	Comparison
For polynomial functions, $$\lim_{x \to a} p(x) = p(a)$$	For rational functions, $$\lim_{x \to a} \frac{p(x)}{q(x)} = \frac{p(a)}{q(a)} \text{ if } q(a) \neq 0$$	If $f(x) = g(x)$ for $x \neq a$ then $$\lim_{x \to a} f(x) = \lim_{x \to a} g(x)$$

1. If plugging in does not give division by 0 then do it!
2. Otherwise do algebra (factor, multiply by conjugate, combine) to get $(x-a)$ in the top and bottom.
3. Cancel $(x-a)$ and return to step **1**.

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1. Compute the limits below.

(A) $\lim\limits_{x \to 1} 5$

(B) $\lim\limits_{x \to 1} x$

(C) $\lim\limits_{x \to 2} x^2 + 3x - 2$

(D) $\lim\limits_{x \to 2} \sqrt{2x - 1}$

2. Compute the limits below.

(A) $\lim\limits_{x \to 1} \dfrac{x + 1}{x^2 + 1}$

(B) $\lim\limits_{x \to 1} \dfrac{x - 1}{x^2 - 1}$

(C) $\lim\limits_{x \to 2} \dfrac{x^2 + 3x - 10}{x^2 - 3x + 2}$

(D) $\lim\limits_{x \to 2} \dfrac{x^2 + x - 6}{x^2 - 2x}$

3. Compute the limits below.

(A) $\lim\limits_{x \to 4} \dfrac{2 - \sqrt{x}}{x - 4}$

(B) $\lim\limits_{x \to 1} \dfrac{\sqrt{3x + 1} - 2}{1 - x^2}$

4. Compute the limits below.

(A) $\lim\limits_{x \to 2} \dfrac{1 - \frac{2}{x}}{x - 2}$

(B) $\lim\limits_{x \to 2} \dfrac{\frac{2}{x+2} - \frac{1}{2}}{x^2 - x - 2}$

5. Compute the limits below.

(A) $\lim\limits_{x \to 0} x \left(\dfrac{2}{x} + x^2 \right)$

(B) $\lim\limits_{x \to 0} \left(\dfrac{1}{x} + \dfrac{5}{x^2 - 5x} \right)$

(C) $\lim\limits_{x \to 2} (x - 2) \left(1 + \dfrac{3x}{x^2 + x - 6} \right)$

(D) $\lim\limits_{x \to 3} \left(\dfrac{1}{x - 3} - \dfrac{4}{x^2 - 2x - 3} \right)$