

Solving Limits Analytically

$$\lim_{x \rightarrow 2} \frac{-3x^2 + 6x}{2x^2 - 9x + 10}$$

$$\frac{-3(2)^2 + 6(2)}{2(2)^2 - 9(2) + 10} = \frac{-3(4) + 12}{8 - 18 + 10} = \frac{0}{0} \text{ DNE}$$

$$\lim_{x \rightarrow 2} \frac{-3x(\cancel{x-2})}{(\cancel{x-2})(2x-5)}$$

$$\begin{array}{r} x \\ 20 \\ -4 \quad -5 \\ + \\ 9 \end{array}$$

$$\frac{2x^2 - 4x - 5x + 10}{(x-2)(2x-5)}$$

$$\lim_{x \rightarrow 2} \frac{-3x}{2x-5}$$

$$\frac{2x(x-2) - 5(x-2)}{(x-2)(2x-5)}$$

$$\frac{-3(2)}{2(2)-5} = \frac{-6}{4-5} = \frac{-6}{-1} = \boxed{6}$$

$$\lim_{x \rightarrow 4} \frac{x-4}{\sqrt{x-3}-1} \cdot (\sqrt{x-3}+1)$$

$$\lim_{x \rightarrow 4} \frac{(x-4)(\sqrt{x-3}+1)}{(x-3)-1}$$

$$\lim_{x \rightarrow 4} \frac{\cancel{x-4}(\sqrt{x-3}+1)}{\cancel{x-4}}$$

$$\lim_{x \rightarrow 4} \sqrt{x-3} + 1 = \sqrt{4-3} + 1 = \sqrt{1} + 1 = \boxed{2}$$

$$\lim_{x \rightarrow 0} \frac{3x \sin(x)}{2 \cos(x) - 2} = \boxed{0}$$

$$\lim_{x \rightarrow 0} \frac{3x \sin x}{-2(1 - \cos x)}$$

$$\lim_{x \rightarrow 0} \frac{3 \sin x}{-2} \cdot \frac{x}{1 - \cos x}$$

$$\lim_{x \rightarrow 0} \frac{3 \sin x}{-2} \cdot \lim_{x \rightarrow 0} \frac{x}{1 - \cos x}$$

0 · 0

$$\lim_{x \rightarrow 0} 3x \cot x = \boxed{3}$$

$$\lim_{x \rightarrow 0} \frac{3x \cdot \cos x}{\sin x}$$

$$\lim_{x \rightarrow 0} 3 \cos x \cdot \frac{x}{\sin x}$$

$$\lim_{x \rightarrow 0} 3 \cos x \cdot \lim_{x \rightarrow 0} \frac{x}{\sin x}$$

$$3 \cos 0 \quad 1$$

$$3(1)$$

$$3 \cdot 1 = 3$$

$$\lim_{x \rightarrow \pi/2} \frac{\sin x}{x^2} = \boxed{\frac{4}{\pi^2}}$$

$$\frac{\sin \frac{\pi}{2}}{\left(\frac{\pi}{2}\right)^2} = \frac{1}{\frac{\pi^2}{4}} = 1 \cdot \frac{4}{\pi^2}$$

$$\lim_{x \rightarrow 0} \frac{4 \sin(8x) \cdot 8}{3x \cdot 8} = \left(\frac{32}{3} \right)$$

$$\lim_{x \rightarrow 0} \frac{4 \cdot 8 \cdot \sin(8x)}{3 \cdot 8x}$$

$$\frac{32}{3} \cdot 1$$