

Who's excited for limits again? Key

AP Calculus AB: 5.10 L'Hopital's Rule

Evaluate the limits below. Not all questions will be L'Hopital's Rule.

1.  $\lim_{x \rightarrow 1} \frac{x^3 + 4x - 5}{2x^4 - x - 1} = \frac{0}{0}$

$\frac{3x^2 + 4}{8x^3 - 1} = \frac{3 + 4}{7} = \boxed{1}$

2.  $\lim_{x \rightarrow 0} \frac{\sin(2x)}{x} = \frac{0}{0}$

$\frac{\cos(2x) \cdot 2}{1} = \frac{1(2)}{1} = \boxed{2}$

3.  $\lim_{x \rightarrow 1} \frac{\ln(x)}{3x^2 - 7x + 4} = \frac{\frac{1}{x}}{6x - 7}$

$\frac{1}{x(6x-7)}$   
 $\frac{1}{1(6-7)} = \boxed{-1}$

4.  $\lim_{x \rightarrow \pi} \frac{\cos(x)}{e^{3x}} = \frac{-1}{e^{3\pi}}$

5.  $\lim_{x \rightarrow \frac{\pi}{3}} \frac{\sin(x - \frac{\pi}{3})}{x - \frac{\pi}{3}} = \frac{0}{0}$

$\frac{\cos(x - \pi/3)}{1} = \frac{\cos(0)}{1} = \boxed{1}$

6.  $\lim_{x \rightarrow 1} \frac{\ln(x)}{x-1} = \frac{0}{0}$

$\frac{\frac{1}{x}}{\frac{1}{x}} = \frac{1}{x} \quad \frac{1}{1} = \boxed{1}$

7.  $\lim_{x \rightarrow 0} \frac{4x^2}{1 - e^{3x}} = \frac{0}{0}$

$\frac{8x}{-3e^{3x}} \quad \frac{0}{-3e^0} = \frac{0}{-3} = \boxed{0}$

8.  $\lim_{x \rightarrow 0} \frac{\arcsin(x)}{\sin(x) - 2x} = \frac{\frac{1}{\sqrt{1-x^2}}}{\cos(x) - 2} = \frac{1}{\sqrt{1-x^2}(\cos(x) - 2)}$   
 $\frac{1}{1(1-2)} = \boxed{-1}$

9.  $\lim_{x \rightarrow 0} \frac{7x - \sin(3x)}{6x} = \frac{0}{0}$

$\frac{7 - \cos(3x) \cdot 3}{6}$   
 $\frac{7-3}{6} = \boxed{\frac{4}{6}}$

10.  $\lim_{x \rightarrow 0} \frac{\sqrt{e^x} - 1}{x} = \frac{0}{0}$

$\frac{e^{x/2}}{x}$   
 $\frac{\frac{1}{2}e^{x/2}}{1} = \frac{1}{2}e^0 = \boxed{\frac{1}{2}}$

