

L'Hopital's Rule

If $\lim \frac{f(x)}{g(x)} = \frac{0}{0}$ or $\lim \frac{f(x)}{g(x)} = \frac{\infty}{\infty}$, then we can use

$$\lim \frac{f(x)}{g(x)} = \lim \frac{f'(x)}{g'(x)}$$

Example #1:

$$\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$$

Previous Method:

L'Hopital's:

Example #2:

$$\lim_{x \rightarrow 0} \frac{\sin 5x}{x}$$

Example #3:

$$\lim_{x \rightarrow \frac{\pi}{2}} \frac{\sin 2x}{4x^2 - \pi^2}$$

You try:

$$\lim_{x \rightarrow 1} \frac{\ln(2 - x)}{x^3 - 1}$$

MC Possible Questions:

Example #4:

$$\lim_{x \rightarrow 0} \frac{2 - x^2 - 2\cos x}{x^4}$$

Example #5:

$$\lim_{x \rightarrow \infty} \frac{x^2}{e^x}$$

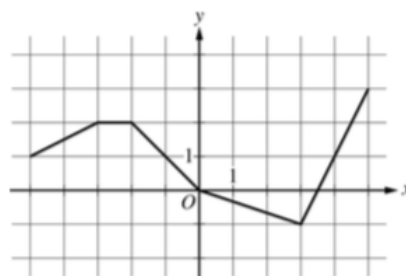
You try:

$$\lim_{x \rightarrow \pi} \frac{\cos x + \sin(2x) + 1}{x^2 - \pi^2} \text{ is}$$

- (A) $\frac{1}{2\pi}$ (B) $\frac{1}{\pi}$ (C) 1 (D) nonexistent

Example #7: FREE RESPONSE

$$\text{Find } \lim_{x \rightarrow 4} \frac{2h(x) - \sqrt{x}}{\sin(\pi x)}.$$

Graph of h Example #6: FREE RESPONSE

Let f be a twice differentiable function where $f(2) = 4$ and $f'(2) = -5$.

Find:

$$\lim_{x \rightarrow 2} \frac{\sqrt{f(x)} - 2}{4 - x^2}$$