

L'hospitals Rule

**No calculator. Evaluate each limit using L'Hopital's Rule. Be sure to justify the conditions necessary for using this rule.**

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

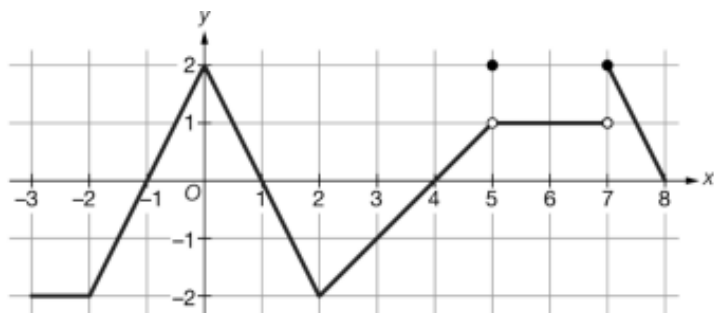
2. 
$$\lim_{x \rightarrow 0} \frac{\sin^2(3x)}{4x} =$$

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

4. 
$$\lim_{x \rightarrow \infty} \frac{4x^2}{2x^2 - 8} =$$

5. 
$$\lim_{x \rightarrow \infty} \frac{\ln(x)}{\sqrt[3]{x}}$$

6.



This is the graph of the function  $y = f(x)$ .

The graph of the function  $f$  on the closed interval  $-3 \leq x \leq 8$  consists of line segments and the point  $(5, 2)$ , as shown above. The function  $g(x)$  is given by

$$g(x) = \frac{1}{10}(4x^3 + 3x^2 - 10x - 17).$$

Find  $\lim_{x \rightarrow 1} \frac{f(x)}{g(x) + 2}$ . Show the work that leads to your answer.