

1. Compute the value of each of the following limits. In the case that the limit is not a finite number, determine whether it is $+\infty$ or $-\infty$. You must show all your work.

a) $\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{x^2 + 2x - 8}$

b) $\lim_{x \rightarrow +\infty} \frac{\sqrt{4x^2 + 1}}{3x - 5}$

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

d) $\lim_{h \rightarrow 0} \frac{\cos(x + h) - \cos x}{h}$

e) $\lim_{x \rightarrow -2^-} \frac{1}{x + 2}$

2. Find the following limits. You must show all your work.

a) $\lim_{x \rightarrow 3} \frac{x^2 - 7x + 12}{x^2 - x - 6}$

b) $\lim_{x \rightarrow 0} \frac{\tan 3x}{x}$

c) $\lim_{x \rightarrow \infty} (x - \sqrt{x^2 + 2x + 4})$

3. Find the following limits. You must show all your work.

a) $\lim_{x \rightarrow -2} \frac{x^2 + 5x + 6}{x + 2}$

b) $\lim_{x \rightarrow +\infty} \frac{3x^2 + 2x + 5}{-4x^2 + 3x + 2}$

c) $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$

d) $\lim_{h \rightarrow 0} \frac{\sin(x + h) - \sin x}{h}$

e) $\lim_{x \rightarrow 2^-} \left(\frac{1}{x - 2} \right)$

4. Find the following limits. You must show all your work.

a) $\lim_{x \rightarrow 3} \frac{x^2 - x - 6}{x^2 - 2x - 3}$

b) $\lim_{x \rightarrow 0} \frac{3x}{\sin 2x}$

c) $\lim_{x \rightarrow \infty} (x - \sqrt{x^2 - 3x + 4})$

d) $\lim_{x \rightarrow 1} \frac{e^{x^2} - e^{1^2}}{x - 1}$

5. Find the following limits. You must show all your work.

a) $\lim_{x \rightarrow 3} \frac{x^2 - 8x + 15}{x^2 + x - 12}$

b) $\lim_{x \rightarrow 0} \frac{\tan 3x}{x}$

c) $\lim_{x \rightarrow \infty} (x - \sqrt{x^2 - 2x + 5})$

6. Use the DEFINITION of the derivative to find $f'(x)$ when $f(x) = \sqrt{2x + 1}$.

7. USING THE DEFINITION of derivative find the derivative of $f(x) = \sqrt{x}$.

8. Use the definition of the derivative to find $f'(x)$ where $f(x) = \frac{1}{x}$.

9. USING THE DEFINITION of derivative find the derivative of $f(x) = \frac{1}{x + 2}$.

10. USING THE DEFINITION of derivative find the derivative of $f(x) = \sqrt{x - 2}$.