

Consider the function below to find each limit. If a limit does not exist, state why.

$$G(x) = \begin{cases} 2x^2 + 3x, & x < -2 \\ -\frac{1}{2}x + 1, & x > -2 \end{cases}$$

a) $\lim_{x \rightarrow -2^-} G(x)$

b) $\lim_{x \rightarrow -2^+} G(x)$

c) $\lim_{x \rightarrow -2} G(x)$

Find each of the following limits analytically. Show your algebraic analysis.

a. $\lim_{x \rightarrow e} \frac{\ln x}{2x}$

b. $\lim_{x \rightarrow 5^-} \left(\frac{2}{5}x^2 + 2x \right)$

c. $\lim_{\theta \rightarrow \pi} (\sin^2 \theta + 2 \cos \theta)$

d. $\lim_{\alpha \rightarrow \frac{5\pi}{3}} \frac{\tan \alpha}{\alpha^2}$

e. $\lim_{x \rightarrow -2} \frac{x^2 - x - 6}{2x + 4}$

f. $\lim_{x \rightarrow 3} \frac{x+5}{x^2-9}$

g. $\lim_{x \rightarrow \frac{3}{2}} \frac{8x^3-27}{2x-3}$

h. $\lim_{x \rightarrow -2} \frac{\sqrt{2x+5}-1}{x+2}$

i. $\lim_{x \rightarrow 1} \frac{1-\sqrt{2x^2-1}}{x-1}$

j. $\lim_{x \rightarrow 0} \frac{\frac{1}{x+2} + \frac{1}{x}}$

k. $\lim_{x \rightarrow 2^+} \frac{3x^2 + 7x + 2}{x^2 - 4}$

l. $\lim_{x \rightarrow 3^+} \frac{2x + 5}{x - 3}$

m. $\lim_{x \rightarrow 3^-} \frac{2x + 5}{x - 3}$

If $f(x) = 2x^2 - 3x + 4$, find $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$.