

1. Evaluate:

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

Hint: *is butter a carb?*

2. Consider the function $f(x) = \frac{e^x}{x^2 - 1}$. Draw the graph of $f(x)$. Where are the asymptotes (horizontal and vertical)?

3. Let

$$f(x) = \begin{cases} x^3 - 2x + 1 & x \geq 2 \\ -x^2 + ax - 3 & x < 2 \end{cases}$$

where a is some real number. For which value(s) of a is $f(x)$ a continuous function?

4. Evaluate:

a. $\lim_{x \rightarrow \infty} \frac{12x^4 + 9x - 3}{(3x + 1)(2 - x)(8x^2 + 4x - 3)}$

b. $\lim_{x \rightarrow -\infty} \frac{e^{e^{\pi x}}}{x}$

c. $\lim_{x \rightarrow \infty} \frac{\sin(x)}{x}$

d. $\lim_{x \rightarrow 0} \sin\left(\frac{1}{x}\right)$

e. $\lim_{x \rightarrow 0} \sqrt{x} \sin(x)$

f. $\lim_{x \rightarrow -\infty} \frac{\tan(x)}{x}$