MATH 1190 PRESS Summer 2025

Calculus Sneak Peak

KENNESAW STATE UNIVERSITY

Limits

Concept Example: Find the values of the function $f(x) = \frac{x^2-4}{x^2+x-6}$ at the values indicated in the table below.

x	$f(x) = \frac{x^2-4}{x^2+x-6}$
1.5	
1.9	
1.99	
1.999	

x	$f(x) = \frac{x^2-4}{x^2+x-6}$
2.5	
2.1	
2.01	
2.001	

What value does the function $f(x) = \frac{x^2-4}{x^2+x-6}$ seem to approach as x gets closer to 2? ___________

1. The graph of a function f is shown below. Use it to state the values (if they exist) of the following:

   a. $\lim\limits_{x \to -4^-} f(x) =$

   b. $\lim\limits_{x \to -4^+} f(x) =$

   c. $\lim\limits_{x \to -4} f(x) =$

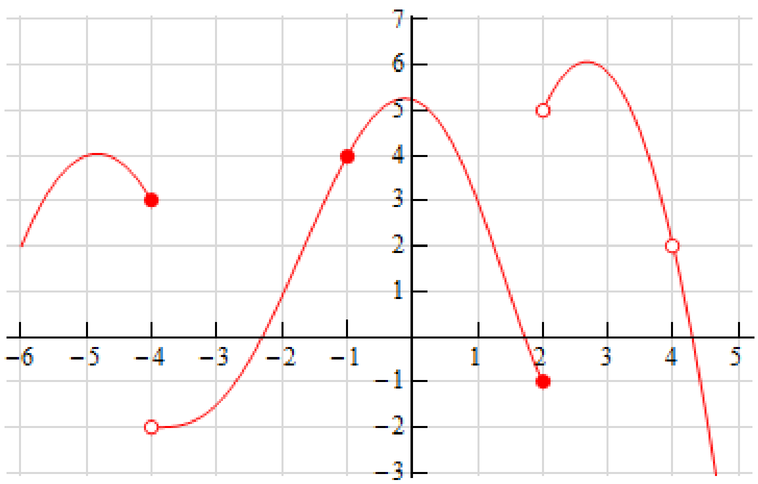
   d. $\lim\limits_{x \to 4^-} f(x) =$

   e. $\lim\limits_{x \to 4^+} f(x) =$

   f. $\lim\limits_{x \to 4} f(x) =$

   g. $f(4) =$

   h. $\lim\limits_{x \to 1} f(x) =$



2. Evaluate each of the following limits, if they exist.

a. $\lim_{x \to -3} \frac{x^2+3x+1}{3x+11}$

b. $\lim_{x \to 3} \frac{x-3}{x^2-9}$

c. $\lim_{h \to 0} \frac{(3+h)^2-9}{h}$

d. $\lim_{x \to 3} \frac{\sqrt{x}-9}{x-3}$

e. $\lim_{t \to -1} \frac{t^2+3t+2}{t^2-t-2}$

The Derivative:

Numerical Approximation Example: Consider the function $f(x) = x^2$. Calculate the slopes of secant lines m_{PQ} from point $P(-1, 1)$ to points $Q(x, x^2)$, for the values of x in the tables below.

x	$m_{PQ} = \dfrac{f(x) - f(a)}{x - a}$
-1.1	
-1.01	
-1.001	

x	$m_{PQ} = \dfrac{f(x) - f(a)}{x - a}$
-0.9	
-0.99	
-0.99	

What happens to the slopes of the secant lines as x gets closer and closer to -1?

Finding the Slope of the Tangent Line: Calculate $f'(a)$ for the following functions $f(x)$ and numbers a using one of the following limit formulas:

$$f'(a) = \lim_{x \to a} \frac{f(x) - f(a)}{x - a} \qquad \text{OR} \qquad f'(a) = \lim_{h \to 0} \frac{f(a + h) - f(a)}{h}$$

1. $f(x) = x^2, \; a = -1$

2. $f(x) = \frac{1}{x}, \ \ a = 2$

3. $y = 4x - 3x^2, \ \ a = 2$

4. $y = \sqrt{x}, \ \ \ a = 1$