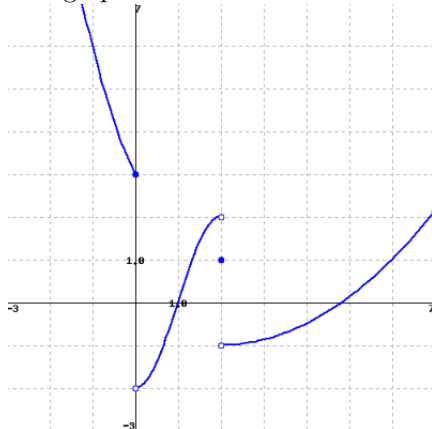


# APPM 1350 Recitation, Fall 2021, Week 3, Sep 07

## Limits with Graphs

The graph of the function  $f$  is:



Evaluate the following:

- $\lim_{x \rightarrow 0^-} f(x)$
- $\lim_{x \rightarrow 2} f(x)$
- $f(0)$
- $\lim_{x \rightarrow 0^+} f(x)$
- $\lim_{x \rightarrow 2^-} f(x)$
- $\lim_{x \rightarrow 2^+} f(x)$
- $f(2)$
- $\lim_{x \rightarrow 1} f(x)$

## Limits with Piecewise Functions

$$f(x) = \begin{cases} -2x - 5 & \text{if } x < -2 \\ x^2 + 1 & \text{if } -2 \leq x < 1 \\ 2 & \text{if } x \geq 1 \end{cases}$$

Evaluate the following. At what values is the function discontinuous?  
Use the definition of continuity to justify your answer.

- $\lim_{x \rightarrow -2^-} f(x)$
- $\lim_{x \rightarrow -2^+} f(x)$
- $f(-2)$
- $f(1)$
- $\lim_{x \rightarrow 1^+} f(x)$
- $\lim_{x \rightarrow 1^-} f(x)$

## Limits with Functions

1. Evaluate  $\lim_{t \rightarrow 0} \frac{\sqrt{t^2 + 16} - 4}{t^2}$
2. Evaluate  $\lim_{x \rightarrow c} \frac{(x-2)|x-1|}{x^2 - 3x + 2}$  for  $c = 1^+, 1^-, 2^+, 2^-$
3. Evaluate  $\lim_{x \rightarrow 0} \frac{\sin 3x}{5x}$
4. Evaluate  $\lim_{x \rightarrow 0} x^2 \cos\left(\frac{1}{x^2}\right)$
5. Evaluate  $\lim_{x \rightarrow 0} \frac{\sin 4x}{5x^3 - 2x}$ . At what values is the function discontinuous?
6. Evaluate  $\lim_{h \rightarrow 0} \frac{(6+h)^2 - 36}{h}$

## Intermediate Value Theorem

Use the Intermediate Value Theorem to show that the following equations have at least one solution:

1.  $x^5 - 6x^3 + 3x + 1 = 0$
2.  $2 \sin(x) = 3 - 2x$