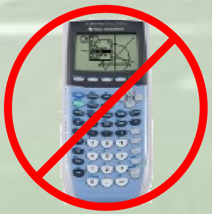
Unit 1 Review

Limits & Continuity

MC1:



If $f(x) = \begin{cases} \dfrac{x^2 - 3x - 4}{x + 1} & x \neq -1 \\ 2 & x = -1 \end{cases}$ what is $\lim\limits_{x \to -1} f(x)$?

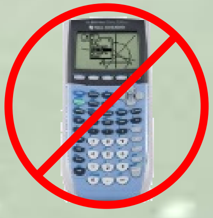
. -5 b. 0 c. 2 d. 3

MC2: $\lim\limits_{x \to 3^+} \dfrac{5}{3 - x} =$

a. ∞

-∞ c. 0 d. -5

MC3: Find the value of C so that the limit as x approaches 10 of g(x) exists.



$$g(x) = \begin{cases} e^{\frac{x}{10}+C} & x < 10 \\ 3 & x = 10 \\ \log(x) + 1 & x < 10 \end{cases}$$

a. 3 b. 2  $\ln(2) - 1$ d. dne

Evaluate the limits

$$1.\ \lim_{x \to 2} \frac{x+1}{x^2-7}$$

$$2.\ \lim_{x \to 4} \frac{x^2-7x+12}{x-4}$$

$$3.\ \lim_{x \to 3} \frac{\sqrt{x+1}-2}{x-3}$$

1. -1
2. 1
3. $1/4$

Evaluate the limits

4. $\lim_{x \to 4} \dfrac{\dfrac{x}{x+1} - \dfrac{4}{5}}{x-4}$

5. $\lim_{x \to 0} \dfrac{\sin^2 5x}{\sin^2 7x}$

6. $\lim_{x \to \infty} \dfrac{7x^2 - 4x + 1}{2x + 9}$

4. 1/25
5. 25/49
6. dne or ∞

Evaluate the limits

$$7.\ \lim_{x\to 0} \frac{\sin 2x}{x\cos x}$$

$$8.\ \lim_{x\to \infty} \frac{x^2 - 4}{7x^4 + x}$$

$$9.\ \lim_{x\to \frac{\pi}{3}} 3\sin x$$

7. 2
8. 0
9. $\frac{3\sqrt{3}}{2}$

10. Find the horizontal and vertical asymptotes.

$$f(x) = \frac{2x^2 + 5x + 2}{x^2 + 5x + 6}$$

10. $x = -3, y = 2$

11. Is the function continuous at the given point? If not, state the type of discontinuity.

$$f(x) = \begin{cases} \frac{x}{2} + 1 & x \le 2 \\ 3 - x & x > 2 \end{cases} \quad \text{at } x = 2?$$

1. $f(2) = \frac{2}{2} + 1 = 1 + 1 = 2$

2. $\lim_{x \to 2^-} f(x) = 2$

$\lim_{x \to 2^+} f(x) = 1$

$\therefore \lim_{x \to 2} = DNE$

Jump Discontinuity

12. For what value(s) of a is the function continuous?

$$h(x)=\begin{cases}5-ax^2 & x<1\\ 4+3x & x\geq 1\end{cases}$$

$$\lim_{x\to 1^-} = \lim_{x\to 1^+}$$

$$5-a(1)^2 = 4+3(1)$$

$$5-a=7$$

$$a=-2$$

13. Given $y = x^2 + 2$, find:

a) the average rate of change on the interval [-2, -3/2].

$$\frac{f(b)-f(a)}{b-a} = \frac{(-3/2)^2 + 2 - [(-2)^2 + 2]}{-3/2+2} = -7/2$$

b) the instantaneous rate of change at $x = 3$.

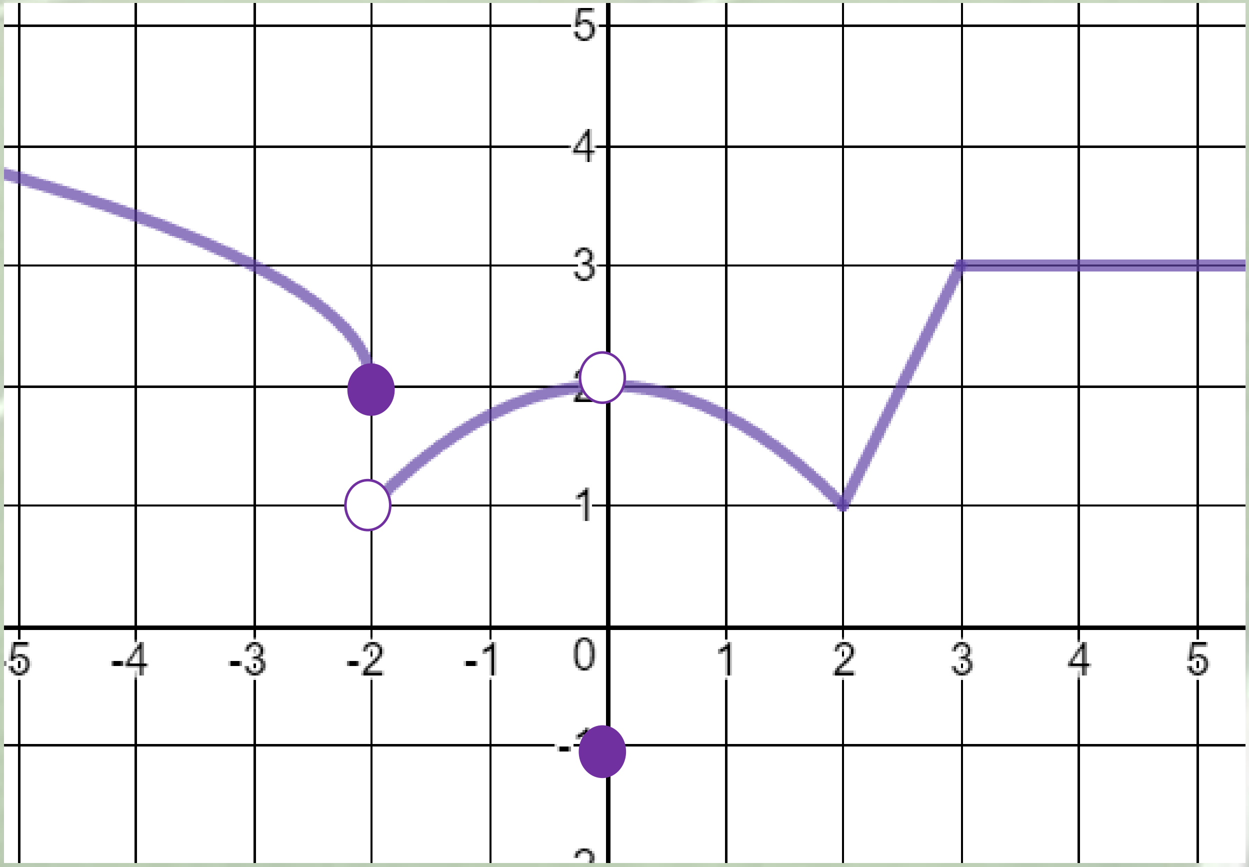
13. Use the graph to find the limits.

a) $\lim_{x \to 2^-} f(x)$

b) $\lim_{x \to 2^+} f(x)$

c) $\lim_{x \to 2} f(x)$

d) $f(2)$



a) 1 b) 1 c) 1 d) 1

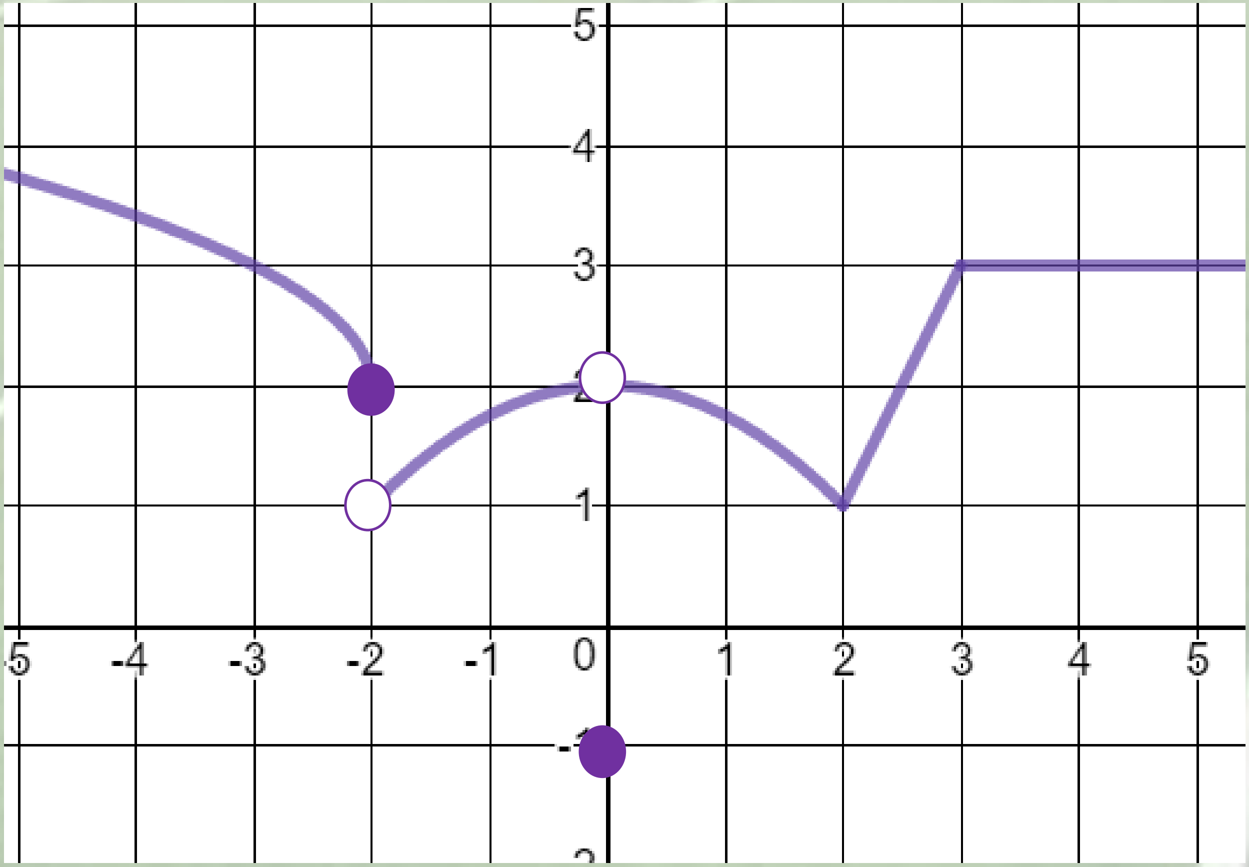
14. Use the graph to find the limits.

a) $\lim_{x \to 0^-} f(x)$

b) $\lim_{x \to 0^+} f(x)$

c) $\lim_{x \to 0} f(x)$

d) $f(0)$



a) 2 b) 2 c) 2 d) – 1

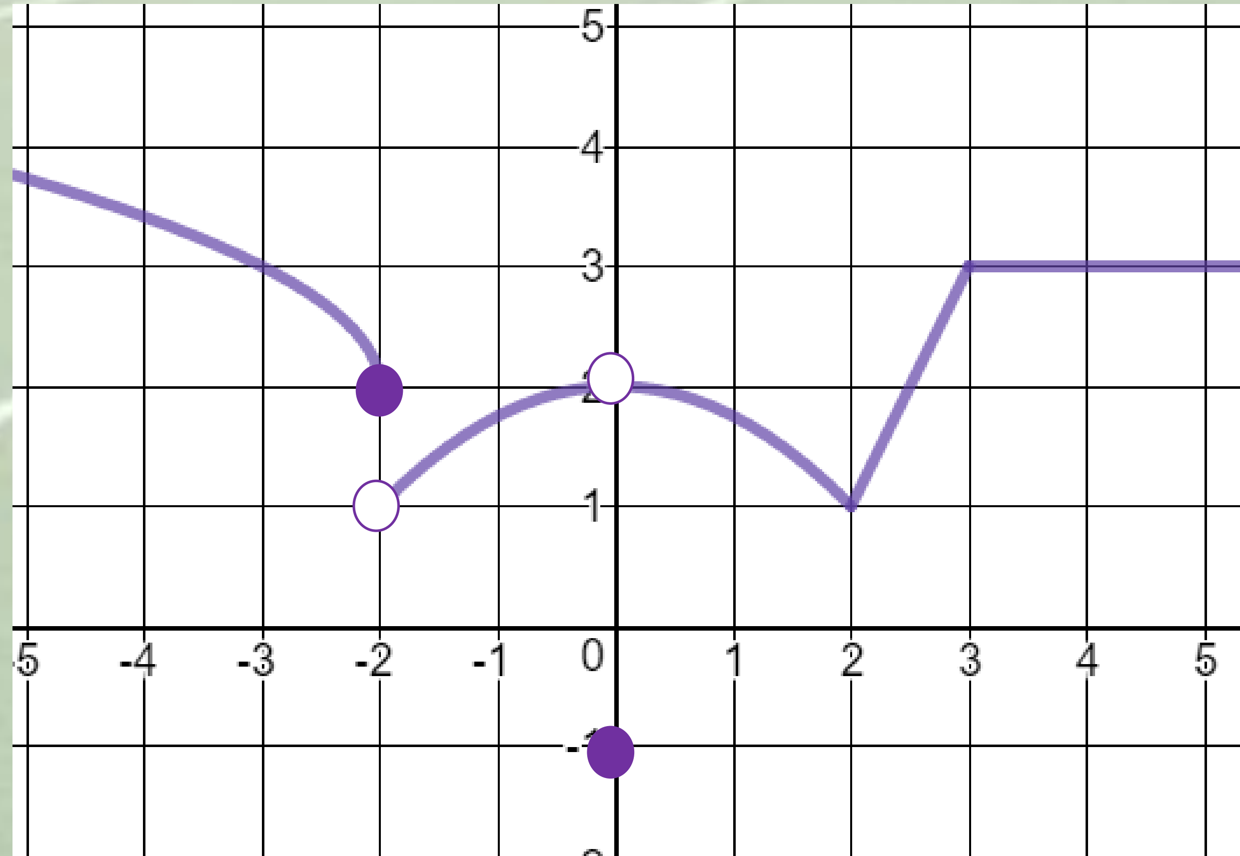
15. Use the graph to find the limits.

a) $\lim_{x \to -2^-} f(x)$

b) $\lim_{x \to -2^+} f(x)$

c) $\lim_{x \to -2} f(x)$

d) $f(-2)$



a) 2 b) 1 c) dne d) 2

FR1: Let h be the function defined by the following where a and b are constants

$$f(x)=\begin{cases}|x-1|+3 & 1\le x\le 2\\ ax^2-bx & x>2\end{cases}$$

If a = -1 and b = -4, is h(x) continuous for all x in [1,∞)? Justify your answer.

$$\lim_{x\to 2^+} f(x)=\lim_{x\to 2^-} f(x)$$

$$-1(2)^2--4(2)=|2-1|+3$$

$$-4+8=1+3$$

$$4=4$$

$$f(2)=\lim_{x\to 2}$$

The function, h(x), is continuous for all x, given a and b because the function has a limit as x approaches 2, the function has a value as x approaches 2, and the limit is equal to the value.

Look over your notes for these topics:

- ♥squeeze Theorem
- ♥IVT
- ♥all limits techniques (graph, table, & algebra)
- ♥average & instantaneous rate of change
- ♥trig limits
- ♥continuity