

Pre-Calculus – Unit 3

Name: _____ Date: _____ Period: _____

ID: 1

Unit 3 REVIEW – Function Analysis

Pre-Calculus

Find the **domain** of the indicated function. Write your answers using inequality notation. **Classify** all discontinuities.

1. $f(x) = \frac{x}{x^2 - 9x} = \frac{x}{x(x-9)}$

$f(x) = \frac{x}{x-9}$

Denom $\neq 0$
 Cancel $\frac{x}{x} \neq 0$
 $x \neq 0$
 stays $\frac{1}{x-9} \neq 0$
 $x \neq 9$

Disc
 Hole @ $x=0$
 VA @ $x=9$

Domain: $\mathbb{R}, x \neq 0, 9$

2. $g(x) = \sqrt{16 - 4x}$

RADICAND ≥ 0
 $16 - 4x \geq 0$
 $-4x \geq -16$
 $x \leq 4$

Domain: $x \leq 4$

CONTINUOUS ON ITS DOMAIN

3. $h(t) = \frac{\sqrt{t+3}}{t-5}$

Denom $\neq 0$
 Cancel $\frac{\sqrt{t+3}}{t-5} \neq 0$
 stays $t-5 \neq 0$
 $t \neq 5$

RADICAND ≥ 0
 $t+3 \geq 0$
 $t \geq -3$

Disc
 VA @ $x=5$

Domain: $x \geq -3, x \neq 5$

Domain:

$[-4, 4]$

Absolute max/min value(s):

ABS MAX: 17.372
ABS MIN: 0

Local extrema that are NOT absolute:

LOCAL MAX: 1.066
LOCAL MIN: None

Increasing:

$(-4, -2.176) \cup (3, 3.676)$

Decreasing:

$(-2.176, 3) \cup (3.676, 4)$

Left End-behavior:

$\lim_{x \rightarrow -\infty} f(x) = \text{DNE}$

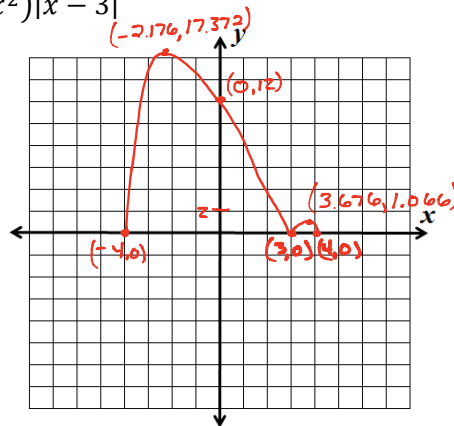
Right End-behavior:

$\lim_{x \rightarrow \infty} f(x) = \text{DNE}$

4. $g(x) = (\sqrt{16 - x^2})|x - 3|$

OPTIONAL WORK

RADICAND ≥ 0
 $16 - x^2 \geq 0$
 Boundary
 $16 - x^2 = 0$
 $16 = x^2$
 $\pm 4 = x$
 $16 - x^2 \geq 0$
 $[-4, 4]$
 Domain: $-4 \leq x \leq 4$



Find the value of the given function at the indicated domain value.

$$g(x) = \begin{cases} -2x^2 + 7x + 5, & x \leq 0 \\ 3 - x^3, & 2 < x < 8 \\ \sqrt{x + 17}, & x \geq 8 \end{cases}$$

$$h(x) = \begin{cases} 5x^2 - 7x - 5, & x \leq -10 \\ x^3 - x, & -10 < x \leq 10 \\ 5x - |x - 25|, & x > 10 \end{cases}$$

5. $g(8) = \sqrt{8+17}$
 $= \sqrt{25}$
 $g(8) = 5$

6. $h(-1) = 5(-1)^2 - 7(-1) - 5$
 $= 5(1) + 7 - 5$
 $= 5 + 7 - 5$
 $h(-1) = 7$

7. $h(10) = 5(10)^2 - 7(10) - 5$
 $= 50 - 70 - 5$
 $= 50 - 15$
 $h(10) = 35$

8. $g(1) = \text{DNE}$

Skillz Review: Solve or evaluate.

9. $\sqrt{-95} = \sqrt{-1 \cdot 95}$
 $= i\sqrt{95}$

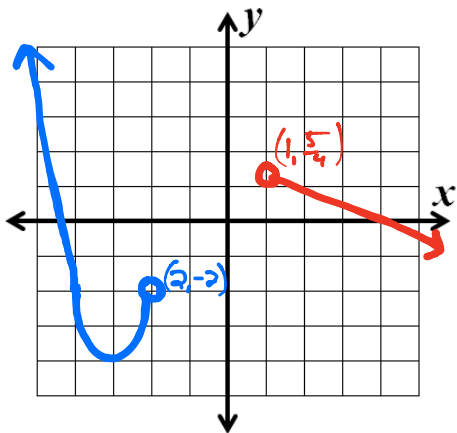
10. $3x^2 = 24$
 $x^2 = 8$
 $x = \pm\sqrt{8}$
 $x = \pm 2\sqrt{2}$

11. $-(x-4)^2 - 5 = -54$
 $-(x-4)^2 = -49$
 $(x-4)^2 = 49$
 $x-4 = \pm\sqrt{49}$
 $x = 4 \pm 7$

12. $3(x+6)^2 + 20 = -28$
 $3(x+6)^2 = -48$
 $(x+6)^2 = -16$
 $x+6 = \pm\sqrt{-16}$
 $x = -6 \pm 4i$

Graph the following piecewise functions.

$$13. h(x) = \begin{cases} 2(x+3)^2 - 4, & x < -2 \\ -\frac{3}{4}x + 2, & x > 1 \end{cases}$$



15. Is the following function continuous? (SHOW WORK!)

$$f(x) = \begin{cases} -x^2 + 2x + 11, & x < -3 \\ 2x + 2, & x \geq -3 \end{cases}$$

$-x^2 + 2x + 11 = 2x + 2$
 $-(-3)^2 + 2(-3) + 11 = 2(-3) + 2$
 $-9 - 6 + 11 = -6 + 2$
 $-15 + 11 = -4$
 $-4 = -4$
 \therefore CONTINUOUS

17. Mr. Kelly wants to create a rectangular feeding pen for his chickens, but only has 80 meters of fencing. He decides to use the side of his house as one side of the pen. $P = 80m$

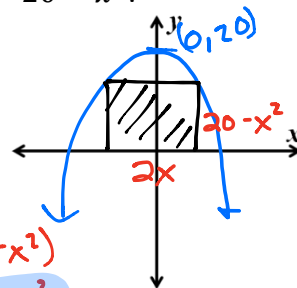


a. If x represents the width of the pen, express its area A in terms of x . (The side of Kelly's house is the length.)
 $A(x) = (80 - 2x)x$
 $A(x) = 80x - 2x^2$

b. What is the domain of the function A (determined by the physical restrictions)?
 $D: (0, 40)$

19. A rectangle has its base on the x -axis and its two upper corners on the parabola $y = 20 - x^2$.

- Draw this scenario on the coordinate plane to the right, and draw one possible rectangle.
- Label the base and height of your rectangle in terms of x .
- Find the function $A(x)$ that represents the area of the rectangle.
- What is the largest possible area of this rectangle?
- At what x -value should the rectangle be drawn for the largest area?



$$A(x) = 2x(20 - x^2)$$

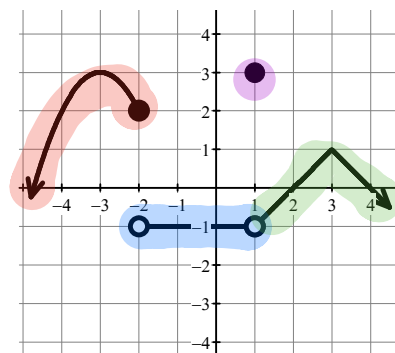
$$A(x) = 40x - 2x^3$$

$$68.853 \text{ m}^2$$

$$2.582 \text{ m}$$

Given the graph of f , write out the function's equation. Use a linear expression ($mx + b$) for straight lines, absolute value if there is a "V" graph.

$$14. f(x) = \begin{cases} -(x+3)^2 - 3 & \text{if } x \leq -2 \\ -1 & \text{if } -2 < x < 1 \\ 3 & \text{if } x = 1 \\ -|x-3| + 1 & \text{if } x > 1 \end{cases}$$



16. What value(s) of k would make the function continuous?

$$g(x) = \begin{cases} -6x^2 + 18x, & x \leq 1 \\ k^2 - k, & x > 1 \end{cases}$$

$-6x^2 + 18x = k^2 - k$
 $-6(1)^2 + 18(1) = k^2 - k$
 $-6 + 18 = k^2 - k$
 $12 = k^2 - k$
 $0 = k^2 - k - 12$
 $0 = (k-4)(k+3)$
 $0 = k-4 \Rightarrow 0 = k+3$
 $4 = k \quad -3 = k$
 $k = -3, 4$

18. Rewrite the function $f(x) = -\frac{3}{4}|x - 12| - 7$ as a piecewise function.

$$f(x) = -\frac{3}{4}(x - 12) - 7 \quad f(x) = \frac{3}{4}(x - 12) - 7$$

$$= -\frac{3}{4}x + 9 - 7 \quad f(x) = \frac{3}{4}x - 9 - 7$$

$$f(x) = -\frac{3}{4}x + 2 \quad f(x) = \frac{3}{4}x - 16$$

$$f(x) = \begin{cases} -\frac{3}{4}x + 2 & \text{if } x > 12 \\ \frac{3}{4}x - 16 & \text{if } x \leq 12 \end{cases}$$

