

AB. Q101. LESSON 1 HOMEWORK

Write each function without the absolute value symbol using a piecewise representation.

$$1. f(x) = 2 + |5 - 2x| \quad f(x) = \begin{cases} 2 + (5 - 2x) & ; 5 - 2x \geq 0 \\ 2 - (5 - 2x) & ; 5 - 2x < 0 \end{cases} = \begin{cases} 7 - 2x & ; x \leq 5/2 \\ 2x - 3 & ; x > 5/2 \end{cases}$$

$$2. g(x) = 5 + \sqrt{(7+x)^2} \quad g(x) = 5 + |7+x| = \begin{cases} 5 + (7+x) & ; 7+x \geq 0 \\ 5 - (7+x) & ; 7+x < 0 \end{cases} = \begin{cases} 12+x & ; x \geq -7 \\ -2-x & ; x < -7 \end{cases}$$

Report the domain using SET and INTERVAL notations.

$$3. y = \frac{x+1}{(x-3)(x+2)} \quad \{x \mid x \neq 3, x \neq -2\} \checkmark \quad x \in (-\infty, -2) \cup (-2, 3) \cup (3, \infty) \checkmark$$

$$4. y = \frac{\sqrt{7-x}}{\sqrt{x+1}} \quad \begin{matrix} 7-x \geq 0 & x \leq 7 \\ x+1 > 0 & x > -1 \end{matrix} \quad \{x \mid -1 < x \leq 7\} \checkmark \quad x \in (-1, 7] \checkmark$$

$$5. y = \begin{cases} 5; & x < 0 \\ \sqrt{x+3}; & \text{elsewhere} \end{cases} \quad \begin{matrix} x \in (-\infty, 9) \cup (9, \infty) \rightarrow x \neq 9 \\ \{x \mid -\infty < x < 9 \text{ or } 9 < x < \infty\} \rightarrow \{x \mid x \neq 9\} \end{matrix}$$

$$6. y = \begin{cases} \ln(x+4); & x < 0 \\ \frac{1}{x-4}; & x \geq 0 \end{cases} \quad \begin{matrix} x > -4 \\ x \neq 4 \end{matrix} \quad \begin{matrix} \{x \mid x > -4, x \neq 4\} \\ x \in (-4, 4) \cup (4, \infty) \end{matrix}$$

$$7. y = \sec x \quad \begin{matrix} \cos x = 0 \quad \frac{\pi}{2} \\ \{x \mid x \neq \frac{\pi}{2} + \pi k \text{ where } k \text{ is an integer}\} \\ x \neq \frac{\pi}{2} + \pi k \text{ where } k \text{ is an integer} \end{matrix}$$

Mixed Review (Algebra Essentials)

[SET]

$$8. \text{ Solve the inequality: } -5 \leq \frac{14-3x}{2} < 1 \quad \begin{matrix} -10 \leq 14-3x < 2 \\ -24 \leq -3x < -12 \\ 8 \leq x \text{ and } x > 4 \end{matrix} \quad \{x \mid 4 < x \leq 8\}$$

$$9. \text{ Solve the inequality: } x^2 - 10 > 3x \quad \{x \mid -\infty < x < -2 \text{ or } 5 < x < \infty\}$$

$$x^2 - 3x - 10 > 0$$

$$(x-5)(x+2) > 0 \quad \text{Parabola } \uparrow \downarrow \text{ with zeros at } x = -2, 5$$

$$10. \text{ Solve the inequality: } |x-3| < \frac{1}{2}$$

$$x-3 < \frac{1}{2} \quad \text{and} \quad x-3 > -\frac{1}{2}$$

$$x < 7/2 \quad \text{and} \quad x > 5/2$$

$$11. \text{ Solve the inequality: } |2x-7| > 3$$

$$2x-7 > 3 \quad \text{or} \quad 2x-7 < -3$$

$$x > 5 \quad \text{or} \quad x < 2$$

$$12. \text{ Write an equation of a line (in point-slope form) that passes through the points (1,7) and (-3, 2).}$$

$$m = \frac{2-7}{-3-1} = \frac{-5}{-4} = \frac{5}{4}$$

$$y-7 = \frac{5}{4}(x-1)$$

$$y-2 = \frac{5}{4}(x+3)$$

13. Simplify the expression $\frac{f(2+h)-f(2)}{h}$ for the function $f(x) = x^2 + 6x - 4$.

14. Graph the function $f(x) = \begin{cases} 2x+3; & x < 0 \\ x^2; & 0 \leq x < 2 \\ 1; & x \geq 2 \end{cases}$ SEE GRAPH

15. Graph the function $g(x) = \begin{cases} \frac{|x-2|}{x-2}; & x \neq 2 \\ 0; & x = 2 \end{cases}$ SEE GRAPH $g(x) = \begin{cases} \frac{x-2}{x-2}; & x-2 > 0 \\ -\frac{(x-2)}{x-2}; & x-2 < 0 \\ 0; & x=2 \end{cases} = \begin{cases} 1; & x > 2 \\ -1; & x < 2 \\ 0; & x = 2 \end{cases}$

16. Graph the function $r(x) = \begin{cases} x+2; & x \neq -1 \\ 5; & x = -1 \end{cases}$ SEE GRAPH

17. Graph the function $h(x) = \begin{cases} x^2; & x \leq 0 \\ x; & x > 0 \end{cases}$ SEE GRAPH

18. Graph the function $f(x) = x + \sqrt{x^2} + 2$ SEE GRAPH $f(x) = x + |x| + 2 = \begin{cases} 2x + 2; & x \geq 0 \\ 2; & x < 0 \end{cases}$

19. Graph $y = f(g(x))$ AND $y = g(f(x))$ for the functions $f(x) = 16 - x^2$ and $g(x) = \sqrt{x}$.
Also state the domain of each.

(13)

$$\frac{f(2+h)-f(2)}{h} = \frac{(2+h)^2 + 6(2+h) - 4 - [(2)^2 + 6(2) - 4]}{h}$$

$$= \frac{4 + 4h + h^2 + 12 + 6h - 4 - [12]}{h} = \frac{h^2 + 10h}{h} = \frac{h(h+10)}{h}$$

$$= \boxed{h+10}$$

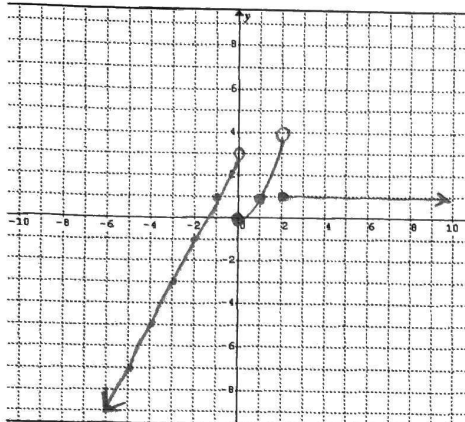
Can only input positive values

(19)

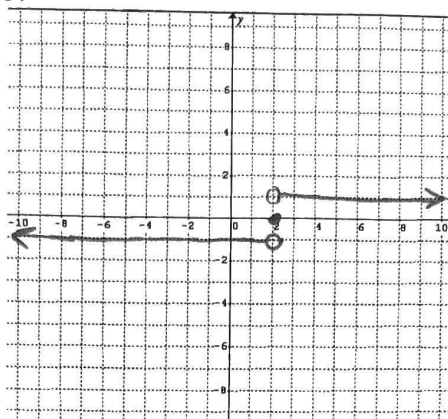
$$f(g(x)) = f(\sqrt{x}) = 16 - (\sqrt{x})^2 = 16 - x \quad \text{ray} \quad D: \{x | x > 0\}$$

$$g(f(x)) = g(16 - x^2) = \sqrt{16 - x^2} \quad \text{semi-circle} \quad D: \{x | -4 \leq x \leq 4\}$$

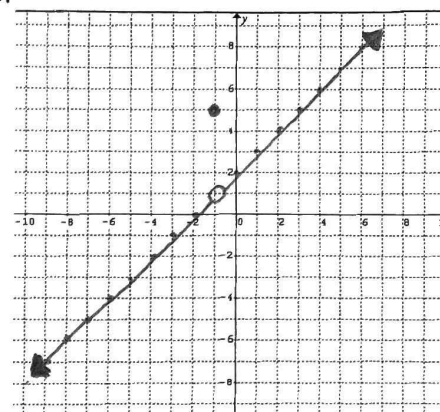
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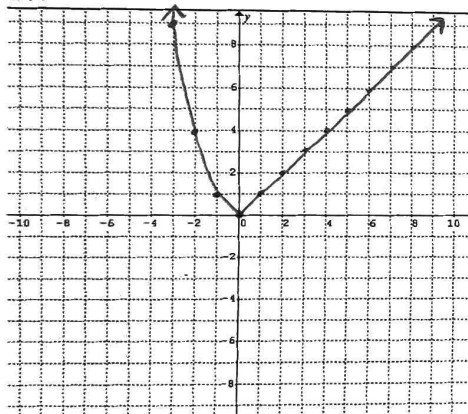
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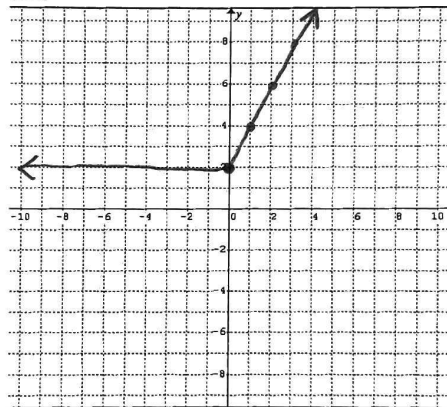
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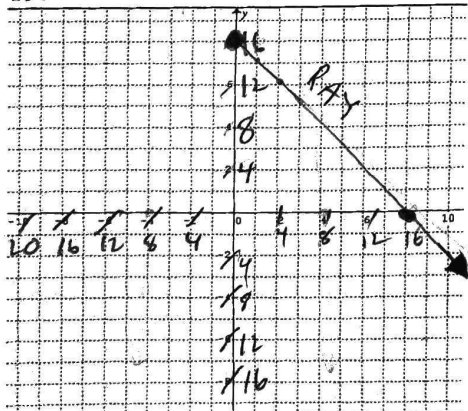
17.



18.



19.



19.

