

7.1 Functions

1. Quadratic, D1
2. Absolute value, stretch, R1, D3
3. Square Root, reflection, R2
4. Cubic, reflection, up 3
5. Logarithmic, R1
6. Absolute value, L5, D2
7. Logarithmic, L2, D3
8. Square root, up 5
Domain: $[0, \infty)$ Range: $[5, \infty)$
9. Quadratic, reflection, up 1
Domain: $(-\infty, \infty)$ Range: $(-\infty, 1]$
10. Absolute value, reflection, R2
Domain: $(-\infty, \infty)$ Range: $(-\infty, 0]$
11. Logarithmic, R2 U7
Domain: $(2, \infty)$ Range: $(-\infty, \infty)$
12. logarithmic, D4
Domain: $(0, \infty)$ Range: $(-\infty, \infty)$
13. $y = |x-3| + 5$
14. $y = \sqrt{x+2} - 4$
15. $y = -x^3 - 2$
16. $y = -\log_7 x + 3$
17. $y = 0.45(x+8)^2$
18. B
19. quadratic
cubic
square root
Logarithmic
exponential

7.2 End Behavior

1. Total: 3
Real: 3
Imaginary: 0
 $y \rightarrow -\infty, x \rightarrow -\infty$
 $y \rightarrow \infty, x \rightarrow \infty$

2. Total: 3
Real: 3
imag: 0
 $y \rightarrow -\infty, x \rightarrow -\infty$
 $y \rightarrow \infty, x \rightarrow \infty$

3. Total: 3
Real: 1
Imag: 2
 $y \rightarrow -\infty, x \rightarrow -\infty$
 $y \rightarrow \infty, x \rightarrow \infty$

4. Total: 2
Real: 0
imag: 2
 $y \rightarrow \infty, x \rightarrow -\infty$
 $y \rightarrow \infty, x \rightarrow \infty$

5. Total: 5
Real: 3
Imag: 2
 $y \rightarrow -\infty, x \rightarrow -\infty$
 $y \rightarrow \infty, x \rightarrow \infty$

6. Total: 2
Real: 2
Imag: 0
 $y \rightarrow -\infty, x \rightarrow -\infty$
 $y \rightarrow -\infty, x \rightarrow \infty$

7. Total: 2
Real: 2
Imag: 0
 $y \rightarrow \infty, x \rightarrow -\infty$
 $y \rightarrow \infty, x \rightarrow \infty$

8. Total: 2
Real: 0
Imag: 2
 $y \rightarrow \infty, x \rightarrow -\infty$
 $y \rightarrow \infty, x \rightarrow \infty$

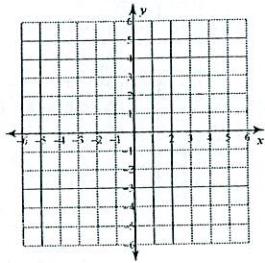
9. Total: 5
Real: 1
Imag: 4
 $y \rightarrow -\infty, x \rightarrow -\infty$
 $y \rightarrow \infty, x \rightarrow \infty$

10. Total: 2
Real: 0
Imag: 2
 $y \rightarrow -\infty, x \rightarrow -\infty$
 $y \rightarrow -\infty, x \rightarrow \infty$

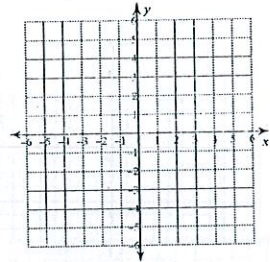
Graphing Absolute Value Functions

Graph each equation.

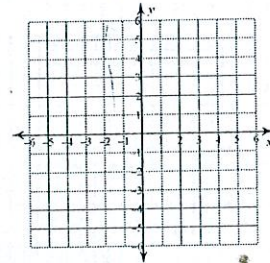
1) $y = |x - 2| - 4$



3) $y = |x| + 1$



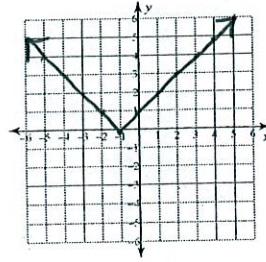
5) $y = |x + 2|$



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2) $y = |x + 1|$



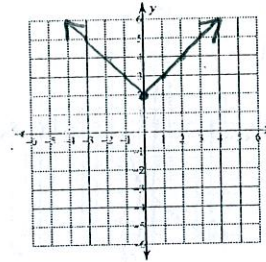
vertex: $(-1, 0)$

D: $(-\infty, \infty)$

R: $[0, \infty)$

EB: $y \rightarrow \infty, x \rightarrow -\infty$
 $y \rightarrow \infty, x \rightarrow \infty$

4) $y = |x| + 2$



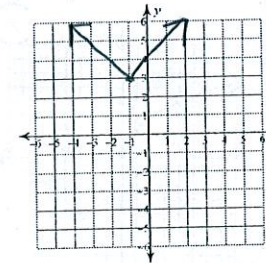
vertex: $(0, 2)$

D: $(-\infty, \infty)$

R: $[2, \infty)$

EB: $y \rightarrow \infty, x \rightarrow -\infty$
 $y \rightarrow \infty, x \rightarrow \infty$

6) $y = |x + 1| + 3$



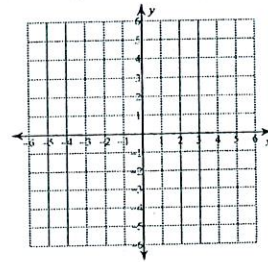
vertex: $(-1, 3)$

D: $(-\infty, \infty)$

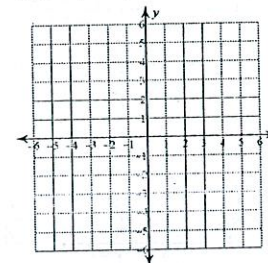
R: $[3, \infty)$

EB: $y \rightarrow \infty, x \rightarrow -\infty$
 $y \rightarrow \infty, x \rightarrow \infty$

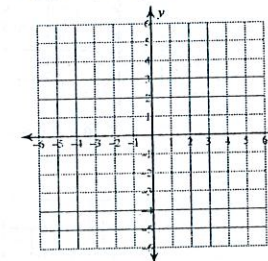
7) $y = -|x - 2| - 2$



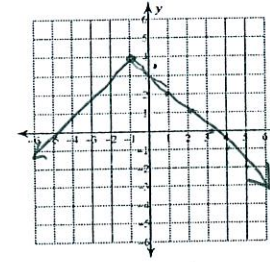
9) $y = -|x + 4| + 2$



11) $y = -|x - 2| + 4$



8) $y = -|x + 1| + 4$



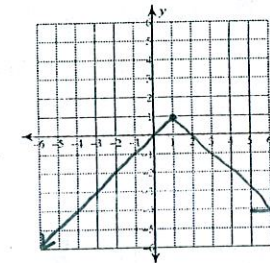
vertex: $(-1, 4)$

D: $(-\infty, \infty)$

R: $(-\infty, 4]$

EB: $y \rightarrow -\infty, x \rightarrow -\infty$
 $y \rightarrow -\infty, x \rightarrow \infty$

10) $y = -|x - 1| + 1$



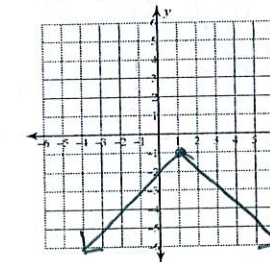
vertex: $(1, 1)$

D: $(-\infty, \infty)$

R: $(-\infty, 1]$

EB: $y \rightarrow -\infty, x \rightarrow -\infty$
 $y \rightarrow -\infty, x \rightarrow \infty$

12) $y = -|x - 1| - 1$



vertex: $(1, -1)$

D: $(-\infty, \infty)$

R: $(-\infty, -1]$

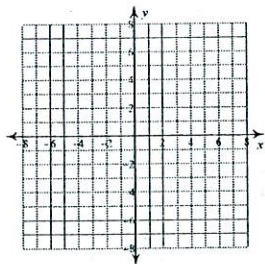
EB: $y \rightarrow -\infty, x \rightarrow -\infty$
 $y \rightarrow -\infty, x \rightarrow \infty$

Graphing Square Root Functions

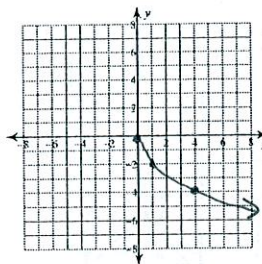
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Identify the domain and range of each. Then sketch the graph.

1) $y = -2\sqrt{x+1}$

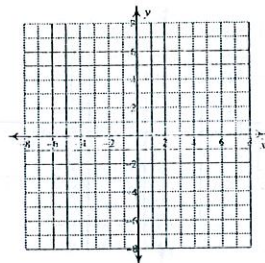


2) $y = -2\sqrt{x}$

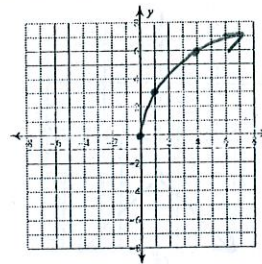


$D: [0, \infty)$
 $R: (-\infty, 0]$
EB:
 $y \rightarrow 0, x \rightarrow 0$
 $y \rightarrow -\infty, x \rightarrow \infty$

3) $y = 2\sqrt{x+2} - 3$

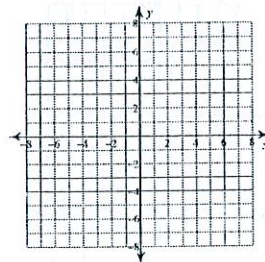


4) $y = 3\sqrt{x}$

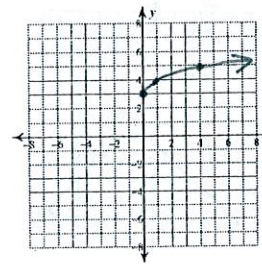


$D: [0, \infty)$
 $R: [0, \infty)$
EB:
 $y \rightarrow 0, x \rightarrow 0$
 $y \rightarrow \infty, x \rightarrow \infty$

5) $y = \sqrt{x-1}$

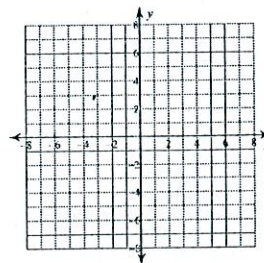


6) $y = \sqrt{x+3}$

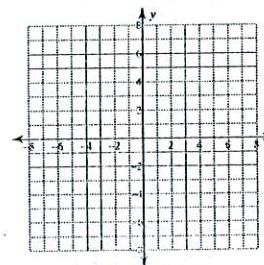


$D: [0, \infty)$
 $R: [3, \infty)$
EB:
 $y \rightarrow 3, x \rightarrow 0$
 $y \rightarrow \infty, x \rightarrow \infty$

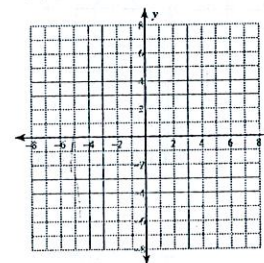
7) $y = \sqrt{x+2}$



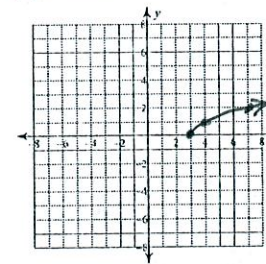
9) $y = \sqrt{x+6}$



11) $y = \sqrt{x}$

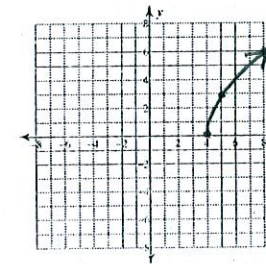


8) $y = \sqrt{x-3}$



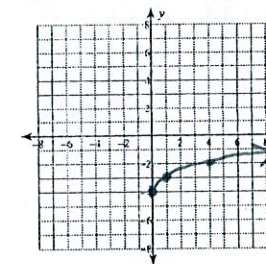
$D: [3, \infty)$
 $R: [0, \infty)$
EB:
 $y \rightarrow 0, x \rightarrow 3$
 $y \rightarrow \infty, x \rightarrow \infty$

10) $y = 3\sqrt{x-4}$



$D: [4, \infty)$
 $R: [0, \infty)$
EB:
 $y \rightarrow 0, x \rightarrow 4$
 $y \rightarrow \infty, x \rightarrow \infty$

12) $y = \sqrt{x-4}$



$D: [0, \infty)$
 $R: [-4, \infty)$
EB:
 $y \rightarrow -4, x \rightarrow 0$
 $y \rightarrow \infty, x \rightarrow \infty$

Name Answer Key
 Period _____

Worksheet - Piecewise Functions

Evaluate the following for $f(x) = \begin{cases} 3x - 5, & x > 4 \\ x^2, & x \leq 4 \end{cases}$:

1. $f(7)$
 $3(7) - 5$
 $21 - 5$
 (16)

2. $f(4)$
 $x^2 = 4^2$
 $= 16$

3. $f(-3)$
 $(-3)^2 = (9)$

Evaluate the following for $f(x) = \begin{cases} -2|x+1|, & x \leq 1 \\ 3, & 1 < x < 3 \\ 6 - 2x, & x \geq 3 \end{cases}$:

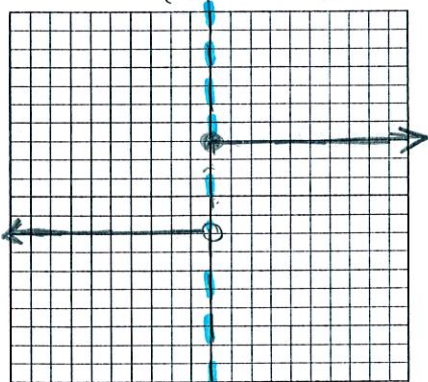
4. $f(10)$
 $6 - 2(10)$
 $6 - 20$
 (-14)

5. $f(2)$
 3

6. $f(0)$
 $-2|0+1|$
 $-2(1) = (-2)$

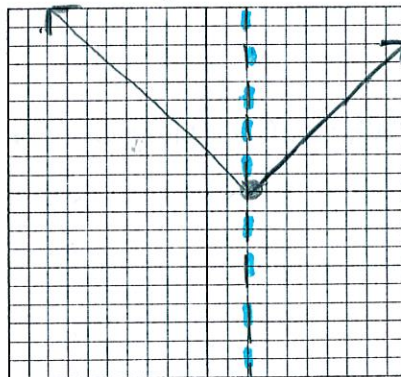
Graph the following piecewise functions.

7. $f(x) = \begin{cases} -2, & x < 0 \\ 3, & x \geq 0 \end{cases}$



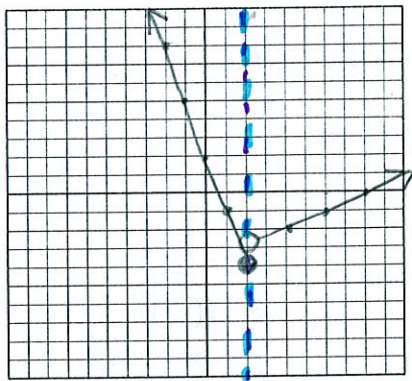
$D: (-\infty, \infty)$
 $R: [-2] \cup [3]$
 Discontinuous

8. $g(x) = \begin{cases} -x + 2, & x < 2 \\ x - 2, & x \geq 2 \end{cases}$



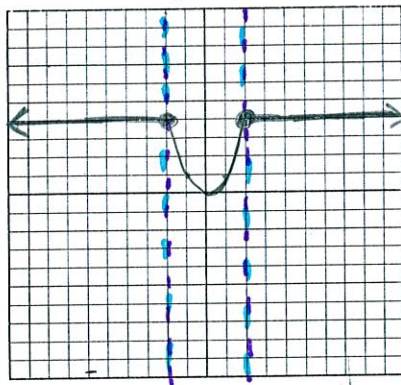
$D: (-\infty, \infty)$
 $R: [0, \infty)$
 Continuous

$$9. h(x) = \begin{cases} -3x+2, & x \leq 2 \\ \frac{1}{2}x-4, & x > 2 \end{cases}$$



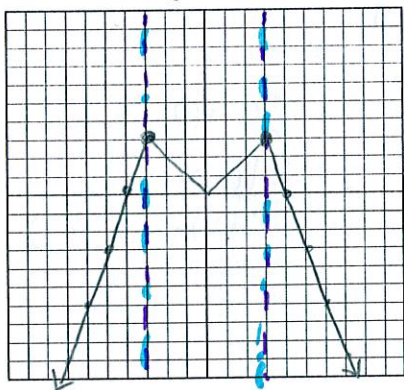
D: $(-\infty, \infty)$
 R: $[4, \infty)$
 Discontinuous

$$10. f(x) = \begin{cases} 4, & x \leq -2 \\ x^2, & -2 < x < 2 \\ 4, & x \geq 2 \end{cases}$$



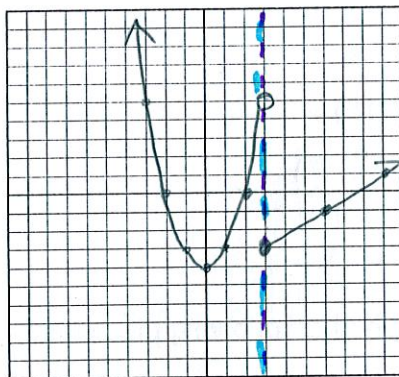
D: $(-\infty, \infty)$
 R: $[0, 4]$
 Continuous

$$11. g(x) = \begin{cases} 3x+12, & x \leq -3 \\ |x|, & -3 < x < 3 \\ -3x+12, & x \geq 3 \end{cases}$$



D: $(-\infty, \infty)$
 R: $(-\infty, 3]$
 Continuous

$$12. h(x) = \begin{cases} x^2-4, & x < 3 \\ \frac{2}{3}x-5, & x \geq 3 \end{cases}$$



D: $(-\infty, \infty)$
 R: $[-4, \infty)$
 Discontinuous

13. Which of the piecewise functions are continuous?

14. Which of the piecewise functions are discontinuous?

Step Functions Worksheet

1) Rewrite $f(x) = \lfloor x \rfloor$ as a piecewise linear function from $6 \leq x < 8$.

$$f(x) = \begin{cases} 6 & \text{if } 6 \leq x < 7 \\ 7 & \text{if } 7 \leq x < 8 \end{cases}$$

2) Evaluate

a) $\lfloor 5.7 \rfloor = 5$

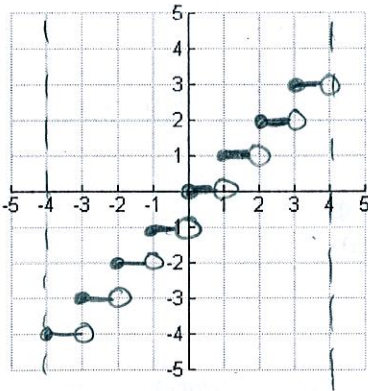
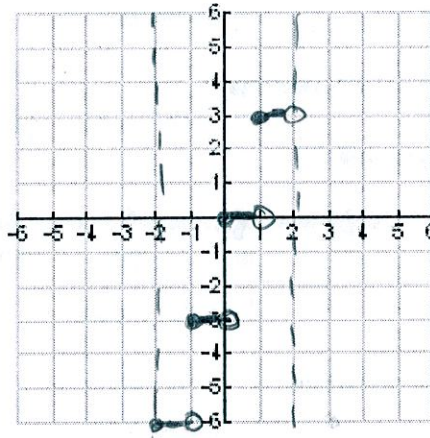
c) $\lfloor 3\pi \rfloor = 9$

e) $\lfloor 0.2 \rfloor = 0$

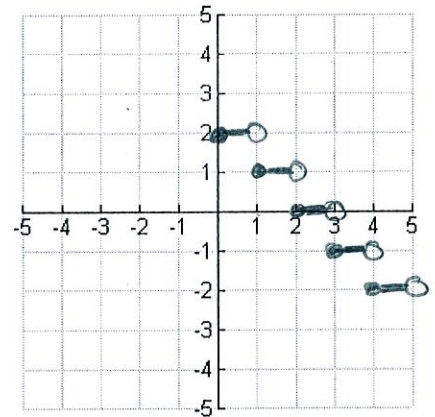
b) $2\lfloor \sqrt{5} \rfloor = 4$

d) $\lfloor -6.1 \rfloor = -7$

f) $5\lfloor -9.1 \rfloor = -50$

3) Sketch the graph of $f(x) = \lfloor x \rfloor$ from $-4 \leq x < 4$ 4) Sketch the graph of $f(x) = 3\lfloor x \rfloor$ from $-2 \leq x < 2$ 

$$\begin{aligned} f(x) &= 3\lfloor 2 \rfloor = -6 \\ &= 3\lfloor -1 \rfloor = -3 \end{aligned}$$

5) Sketch the graph of $f(x) = 2 - \lfloor x \rfloor$ from $0 \leq x < 5$ 

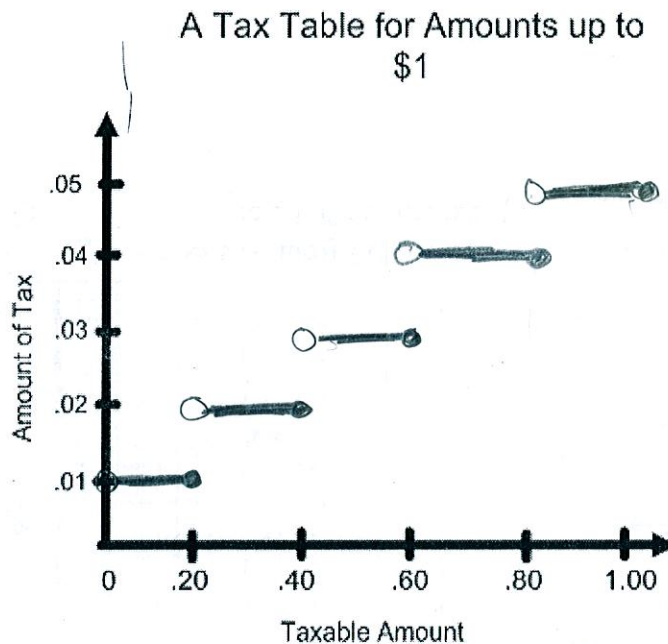
$2 - \lfloor 0 \rfloor = 2$

$2 - \lfloor 1 \rfloor = 1$

You are selling candy bars. The taxable amounts and tax imposed up to \$1 are shown below.

- For amounts between \$0.01 and \$0.20, the tax is \$.01.
- For amounts greater than \$0.20 and less than or equal to \$0.40, the tax is \$0.02.
- For amounts greater than \$0.40 and less than or equal to \$0.60, the tax is \$0.03.
- For amounts greater than \$0.60 and less than or equal to \$0.80, the tax is \$0.04.
- For amounts greater than \$0.80 and less than or equal to \$1.00, the tax is \$0.05.

6) Complete the graph to show the tax imposed on the candy bars.



Use the graph to answer the following questions:

7) A candy bar costs \$0.55. What is the total cost with tax?

$$0.55 + 0.03 = \$0.58$$

8) Your aunt purchased three candy bars at \$0.55 a piece. What is the total cost with tax?

$$(0.58)(3) = \$1.74$$

9) Someone purchased 4 candy bars at \$0.55 a piece. They gave you \$2 and a quarter. Is this enough money to cover the candy bars and the tax? Explain your answer.

$$(0.58)(4) = \$2.32$$

NO! \$0.07 off!

7.6 Compositions of Functions

1. $(f+g)(x)$
 $2x+4 + 3x-6$
 $5x-2$

2. $(f-g)(x)$
 $(2x+4) - (3x-6)$
 $2x+4-3x+6$
 $-1x+10$

3. $(f \cdot g)(x)$
 $(2x+4)(3x-6)$
 $6x^2 - 12x + 12x - 24$
 $6x^2 - 24$

4. $(g-f)(x)$
 $(3x-6) - (2x+4)$
 $3x-6-2x-4$
 $1x-10$

5. $(g \div f)(x)$
 $\frac{3x-6}{2x+4} = \frac{3(x-2)}{2(x+2)}$

6. $2f(x) + 3g(x)$
 $2(2x+4) + 3(2x+4)$
 $4x+8 + 6x+12$
 $10x+20$

7. $(2x+1)(2x+1)$
 $4x^2 + 2x + 2x + 1$
 $4x^2 + 4x + 1$

8. $(3x-2)(3x-2)$
 $9x^2 - 6x - 6x + 4$
 $9x^2 - 12x + 4$

9. $(x+9)(x+9)$
 $x^2 + 9x + 9x + 81$
 $x^2 + 18x + 81$

10. $(3x+5)(3x+5)$
 $9x^2 + 15x + 15x + 25$
 $9x^2 + 30x + 25$

11. $(4x-6)(4x-6)$
 $16x^2 - 24x - 24x + 36$
 $16x^2 - 48x + 36$

12. $(x-2)(x-2)$
 $x^2 - 2x - 2x + 4$
 $x^2 - 4x + 4$

13. $(f \circ g)(x) = f(g(x))$
 $2(3x-6) + 4$
 $6x-12+4$
 $f(3x-6)$

14. $(g \circ f)(x) = g(f(x)) = g(2x+4)$
 $3(2x+4) - 6$
 $6x+12-6$

$$15. (f \circ g)(2) = f(g(2))$$

$$g(2) = 3(2) - 6 = 6 - 6 = 0$$

$$f(0) = 2(0) + 4 = 4$$

$$f(g(2)) = 4$$

$$16. (g \circ f)(-3) = g(f(-3))$$

$$f(-3) = 2(-3) + 4 = -6 + 4 = -2$$

$$g(-2) = 3(-2) - 6 = -6 - 6 = -12$$

$$g(f(-3)) = -12$$

$$17. (f \circ g)(x) = f(g(x))$$

$$2(x^2 - 4) - 5 \quad \downarrow$$

$$2x^2 - 8 - 5 \quad f(x^2 - 4)$$

$$2x^2 - 13$$

$$18. (g \circ f)(x) = g(f(x))$$

$$(2x - 5)^2 - 4$$

$$(2x - 5)(2x - 5) - 4$$

$$4x^2 - 10x - 10x + 25 - 4$$

$$4x^2 - 20x + 21$$

$$19. f(g(4))$$

$$g(4) = 4^2 - 4 = 16 - 4 = 12$$

$$f(12) = 2(12) - 5 = 24 - 5 = 19$$

$$f(g(4)) = 19$$

$$20. g(f(-5))$$

$$f(-5) = 2(-5) - 5 = -10 - 5 = -15$$

$$g(-15) = (-15)^2 - 4 = 225 - 4 = 221$$

$$g(f(-5)) = 221$$

$$21. f(g(x))$$

$$4(2x^2 + 3) - 3$$

$$8x^2 + 12 - 3$$

$$8x^2 + 9$$

$$22. g(f(x))$$

$$2(4x - 3)^2 + 3$$

$$2(4x - 3)(4x - 3) + 3$$

$$2(16x^2 - 12x - 12x + 9) + 3$$

$$2(16x^2 - 24x + 9) + 3$$

$$32x^2 - 48x + 18 + 3$$

$$32x^2 - 48x + 21$$

$$23. f(g(-10))$$

$$g(-10) = 2(-10)^2 + 3$$

$$= 2(100) + 3$$

$$= 203$$

$$f(203) = 4(203) - 3$$

$$= 809$$

$$24. g(f(3))$$

$$f(3) = 4(3) - 3 = 12 - 3 = 9$$

$$g(9) = 2(9)^2 + 3$$

$$= 2(81) + 3$$

$$= 165$$