ANSWER PRESENTATION TOOL

1. To evaluate $f(g(4))$, first find $g(4)$.

$g(4) = 2(4) - 5 = 3$

Then $f(3) = \sqrt{3 + 1} = \sqrt{4} = 2$.

So, $f(g(4)) = 2$.

3. To evaluate $g(h(-2))$, first find $h(-2)$.

$h(-2) = 3(-2)^2 - 3 = 9$

Then $g(9) = 2(9) - 5 = 13$.

So, $g(h(-2)) = 13$.

5. To evaluate $h(f(10))$, first find $f(10)$.

$f(10) = \sqrt{10 + 1} = \sqrt{11}$

Then $h(\sqrt{11}) = 3(\sqrt{11})^2 - 3 = 30$.

So, $h(f(10)) = 30$.

7. To evaluate $g(g(-2.5))$, first find $g(-2.5)$.

$g(-2.5) = 2(-2.5) - 5 = -10$

Then $g(-10) = 2(-10) - 5 = -25$.

So, $g(g(-2.5)) = -25$.

9. a. $f(g(x)) = f(x + 6) = -5(x + 6) = -5x - 30$

The domain of $f(g(x))$ is all real numbers.

b. $g(f(x)) = g(-5x) = -5x + 6$

The domain of $g(f(x))$ is all real numbers.

c. $f(f(x)) = f(-5x) = -5(-5x) = 25x$

The domain of $f(f(x))$ is all real numbers.

11. a. $f(g(x)) = f(x - 1)$

$= 2(x - 1)^2$

$= 2(x^2 - 2x + 1)$

$= 2x^2 - 4x + 2$

The domain of $f(g(x))$ is all real numbers.

b. $g(f(x)) = g(2x^2) = 2x^2 - 1$

The domain of $g(f(x))$ is all real numbers.

c. $f(f(x)) = f(2x^2) = 2(2x^2)^2 = 2(4x^4) = 8x^4$

The domain of $f(f(x))$ is all real numbers.

13. a. $f(g(x)) = f(4x + 8) = 3(4x + 8)^{-1} = \dfrac{3}{4x + 8}$

The domain of $f(g(x))$ is all real numbers except $x = -2$, because $f(-2) = 0$ is not in the domain of f.

b. $g(f(x)) = g(3x^{-1}) = 4(3x^{-1}) + 8 = \dfrac{12}{x} + 8$

The domain of $g(f(x))$ is all real numbers except $x = 0$, since 0 is not in the domain of f.

c. $f(f(x)) = f(3x^{-1}) = 3(3x^{-1})^{-1} = 3\left(\dfrac{x}{3}\right) = x$

The domain of $f(f(x))$ is all real numbers except $x = 0$, since 0 is not in the domain of f.

15. a. $f(g(x)) = f\left(\sqrt{x+7}\right) = 3\sqrt{x+7} - 7$

The domain of $f(g(x))$ is $x \geq -7$, such that x is in the domain of g.

b. $g(f(x)) = g(3x-7) = \sqrt{(3x-7)+7} = \sqrt{3x}$

The domain of $g(f(x))$ is $x \geq 0$, because the square root of a negative number is not a real number.

c. $f(f(x)) = f(3x-7)$

$= 3(3x-7) - 7$

$= 9x - 21 - 7$

$= 9x - 28$

The domain of $f(f(x))$ is all real numbers.

17. a. $f(g(x)) = f\left(\sqrt[3]{x-3}\right) = -\sqrt[3]{x-3} + 11$

The domain of $f(g(x))$ is all real numbers.

b. $g(f(x)) = g(-x+11) = \sqrt[3]{(-x+11)-3} = \sqrt[3]{-x+8}$

The domain of $g(f(x))$ is all real numbers.

c. $f(f(x)) = f(-x+11)$

$= -(-x+11) + 11$

$= x - 11 + 11$

$= x$

The domain of $f(f(x))$ is all real numbers.

19. a. $f(g(x)) = f(x^2 + 6x - 10)$

$= 2(x^2 + 6x - 10) + 1$

$= 2x^2 + 12x - 20 + 1$

$= 2x^2 + 12x - 19$

The domain of $f(g(x))$ is all real numbers.

b. $g(f(x) = g(2x + 1)$

$= (2x + 1)^2 + 6(2x + 1) - 10$

$= 4x^2 + 4x + 1 + 12x + 6 - 10$

$= 4x^2 + 16x - 3$

The domain of $g(f(x))$ is all real numbers.

c. $f(f(x)) = f(2x + 1)$

$= 2(2x + 1) + 1$

$= 4x + 2 + 1$

$= 4x + 3$

The domain of $f(f(x))$ is all real numbers.

21. The error is in calculating $(fg)(x)$ rather than $f(g(x))$.

$f(g(x)) = f(4x)$

$= (4x)^2 - 3$

$= 16x^2 - 3$

23. a. $C(g(m)) = C(0.04m)$

$= 2.75(0.04m)$

$= 0.11m$

The coefficient states that each mile travelled costs \$0.11 in gasoline.

b. $C(g(100)) = 0.11(100) = 11$

It costs \$11 in gasoline to travel 100 miles.

25. a. $f(g(-1)) = f(-2) = 7$

b. $g(f(2)) = g(0) = -1$

c. $f(f(0)) = f(3) = -2$

d. $g(g(-2)) = g(1) = 5$

27. The ordered pairs in $f(g(x))$ consists of the ordered pairs consisting of an x-coordinate in g and a y-coordinate of $f(g(x))$. The ordered pairs are $(-10, -5)$, $(-3, 3)$, $(0, 9)$, $(5, -4)$, and $(8,11)$.