ANSWER PRESENTATION TOOL

2. To evaluate $g(f(0))$, first find $f(0)$.

$f(0) = \sqrt{0 + 1} = \sqrt{1} = 1$

Then $g(1) = 2(1) - 5 = -3$.

So, $g(f(0)) = -3$.

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

$g(-1) = 2(-1) - 5 = -7$

Then $h(-7) = 3(-7)^2 - 3 = 144$.

So, $h(g(-1)) = 144$.

6. To evaluate $f(h(-3))$, first find $h(-3)$.

$h(-3) = 3(-3)^2 - 3 = 24$

Then $f(24) = \sqrt{24 + 1} = \sqrt{25} = 5$.

So, $f(h(-3)) = 5$.

8. To evaluate $h\left(h\left(\frac{2}{3}\right)\right)$, first find $h\left(\frac{2}{3}\right)$.

$h\left(\frac{2}{3}\right) = 3\left(\frac{2}{3}\right)^2 - 3 = 3\left(\frac{4}{9}\right) - 3 = \frac{4}{3} - 3 = -\frac{5}{3}$

Then $h\left(-\frac{5}{3}\right) = 3\left(-\frac{5}{3}\right)^2 - 3 = 3\left(\frac{25}{9}\right) - 3 = \frac{25}{3} - 3 = \frac{16}{3}$.

So, $h\left(h\left(\frac{2}{3}\right)\right) = \frac{16}{3}$.

10. a. $f(g(x)) = f(|x + 2|) = |x + 2| - 9$

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

b. $g(f(x)) = g(x - 9) = |(x - 9) + 2| = |x - 7|$

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

c. $f(f(x)) = f(x - 9) = (x - 9) - 9 = x - 18$

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

12. a. $f(g(x)) = f(2x + 5)$

$= (2x + 5)^2 + 7$

$= 4x^2 + 20x + 25 + 7$

$= 4x^2 + 20x + 32$

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

b. $g(f(x)) = g(x^2 + 7)$

$= 2(x^2 + 7) + 5$

$= 2x^2 + 14 + 5$

$= 2x^2 + 19$

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

c. $f(f(x)) = f(x^2 + 7)$

$= (x^2 + 7)^2 + 7$

$= x^4 + 14x^2 + 49 + 7$

$= x^4 + 14x^2 + 56$

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

14. a. $f(g(x)) = f(x^2 - 9) = 10(x^2 - 9)^{-1} = \dfrac{10}{x^2 - 9}$

The domain of $f(g(x))$ is all real numbers except $x = -3$ and $x = 3$, because $g(-3) = 0$ and $g(3) = 0$ are not in the domain of f.

b. $g(f(x)) = g(10x^{-1}) = (10x^{-1})^2 - 9 = \dfrac{100}{x^2} - 9$

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

c. $f(f(x)) = f(10x^{-1}) = 10(10x^{-1})^{-1} = 10\left(\dfrac{x}{10}\right) = x$

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

16. a. $f(g(x)) = f\left(\sqrt{x - 6}\right) = 4\sqrt{x - 6} + 2$

The domain of $f(g(x))$ is $x \geq 6$, such that x is in the domain of g.

b. $g(f(x)) = g(4x + 2)$

$= \sqrt{(4x + 2) - 6}$

$= \sqrt{4x - 4}$

$= \sqrt{4}\,\sqrt{x - 1}$

$= 2\sqrt{x - 1}$

The domain of $g(f(x))$ is $x \geq 1$, because the square root of a negative number is not a real number.

c. $f(f(x)) = f(4x + 2)$

$= 4(4x + 2) + 2$

$= 16x + 8 + 2$

$= 16x + 10$

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

18. a. $f(g(x)) = f\left(\sqrt[3]{x+4}\right) = -6\sqrt[3]{x+4} - 5$

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

b. $g(f(x)) = g(-6x-5) = \sqrt[3]{(-6x-5)+4} = \sqrt[3]{-6x-1}$

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

c. $f(f(x)) = f(-6x-5)$

$= -6(-6x-5) - 5$

$= 36x + 30 - 5$

$= 36x + 25$

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

20. a. $f(g(x)) = f(x^3 - 2x + 4)$

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

$= 3x^3 - 6x + 12 - 1$

$= 3x^3 - 6x + 11$

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

b. $g(f(x) = g(3x-1)$

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

$= (3x)^3 - 3(3x)^2(1) + 3(3x)(1) - 1^3 - 6x + 2 + 4$

$= 27x^3 - 27x^2 + 9x - 1 - 6x + 2 + 4$

$= 27x^3 - 27x^2 + 3x + 5$

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

c. $f(f(x)) = f(3x-1)$

$= 3(3x-1) - 1$

$= 9x - 3 - 1$

$= 9x - 4$

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

22. The error is in not distributing the 4.

$$\begin{aligned} g(f(x)) &= g(x^2 - 3) \\ &= 4(x^2 - 3) \\ &= 4x^2 - 12 \end{aligned}$$

24. a. $p(d(t)) = p(60t)$

$$\begin{aligned} &= 0.03(60t) + 1 \\ &= 0.11m \end{aligned}$$

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.

26. a. $f(g(6)) = f(3) = 4$

b. $g(f(-1)) = g(4) = 1$

c. $f(f(2)) = f(1) = 0$

d. $g(g(3)) = g(0) = -3$

28.

$$\begin{aligned} f(f(x)) - g(f(x)) &= f(x^2 + 1) - g(x^2 + 1) \\ &= [(x^2 + 1)^2 + 1] - [3(x^2 + 1) + 1] \\ &= [x^4 + 2x^2 + 1 + 1] - [3x^2 + 3 + 1] \\ &= [x^4 + 2x^2 + 2] - [3x^2 + 4] \\ &= x^4 - x^2 - 2 \end{aligned}$$

So, Letter B is the correct answer.