F.BF.A.1: Compositions of Functions 2

1 If $f(x) = 2^x - 1$ and $g(x) = x^2 - 1$, determine the value of $(f \circ g)(3)$.

2 If $f(x) = 5x^2 - 1$ and $g(x) = 3x - 1$, find $g(f(1))$.

3 If $f(x) = \log_2 x$ and $g(x) = 2x^2 + 14$, determine the value of $(f \circ g)(5)$.

4 If $f(x) = x^2 + 4$ and $g(x) = 2x + 3$, find $f(g(-2))$.

5 If $f(x) = 3x + 1$ and $g(x) = x^2 - 1$, find $(f \circ g)(2)$.

6 If $h(x) = 2x - 1$ and $g(x) = 3x + 1$, what is the value of $(h \circ g)(2)$?

7 If $f(x) = x - 3$ and $g(x) = x^2$, what is the value of $(f \circ g)(2)$?

8 If $f(x) = 5x - 2$ and $g(x) = \sqrt[3]{x}$, evaluate $(f \circ g)(-8)$.

9 If $f(x) = x^2$ and $g(x) = x + 1$, what is $(f \circ g)(2)$?

10 If $f(x) = x - 2$ and $g(x) = x^2$, find $f(g(3))$.

11 If $f(x) = x^2$ and $g(x) = 2x - 1$, find $(f \circ g)(4)$.

12 If $f(x) = \dfrac{2}{\sqrt{5 - x^2}}$ and $g(x) = x + 1$, evaluate $(f \circ g)(0)$.

13 If $f(x) = 2x + 4$ and $g(x) = x^2 + 1$, find $(f \circ g)(3)$.

14 If $f(x) = 2x - 5$ and $g(x) = \sqrt{x}$, evaluate $(f \circ g)(36)$.

15 If $f(x) = x^2 + 3$ and $g(x) = x - 2$, find $(f \circ g)(2)$.

16 If $f(x) = 2x + 1$ and $g(x) = x^2$, find $(g \circ f)(2)$.

17 If $f(x) = \dfrac{x^3}{3}$ and $g(x) = \sqrt[3]{x}$, find $f(g(9))$.

18 If $f(x) = x^3 + 1$ and $g(x) = x + 4$, find $(f \circ g)(-6)$.

19 If $f(x) = 3x + 2$ and $g(x) = x^2 - 5$, find the value of $(f \circ g)(-3)$.

20 If $f(x) = x^2 - 6$ and $g(x) = 2^x - 1$, determine the value of $(g \circ f)(-3)$.

21 A certain drug raises a patient's heart rate, $h(x)$, in beats per minute, according to the function $h(x) = 70 + 0.2x$, where x is the bloodstream drug level, in milligrams. The level of the drug in the patient's bloodstream is a function of time, t, in hours, according to the formula $g(t) = 300(0.8)^t$. Find the value of $h(g(4))$, the patient's heart rate in beats per minute, to the *nearest whole number*.

22 If $f(x) = 3x^2 + 1$ and $g(x) = 2x + 2$, find
   a $g^{-1}(x)$, the inverse of $g(x)$.
   b $(f \circ g^{-1})(2)$.

23 Given: $f(x) = x^2$ and $g(x) = 2^x$
   a The inverse of g is a function, but the inverse of f is not a function. Explain why this statement is true.
   b Find $g^{-1}(f(3))$ to the *nearest tenth*.

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Answer Section

1 ANS:

$$g(3) = 3^2 - 1$$
$$= 8$$
255.
$$f(8) = 2^8 - 1$$
$$= 255$$

REF: 060322b

2 ANS:

$$f(1) = 5(1)^2 - 1 = 4$$
11. $g(4) = 3(4) - 1$.
$$= 11$$

REF: 010621b

3 ANS:

$$g(x) = 2x^2 + 14$$
$$g(5) = 2(5)^2 + 14 = 64$$
6.
$$f(x) = \log_2 x$$
$$f(64) = \log_2 64 = 6$$

REF: 060725b

4 ANS:

5. $g(-2) = 2(-2) + 3 = -1$. $f(-1) = (-1)^2 + 4 = 5$.

REF: 060921b

5 ANS:
10

REF: 011021b

6 ANS:
13

REF: 069608siii

7 ANS:
1

REF: 019710siii

8 ANS:
−12

REF: 069715siii

9 ANS:
9

REF: 089709siii

10 ANS:
7

REF: 089802siii

11 ANS:
49

REF: 089907siii

12 ANS:
1

REF: 010106siii

13 ANS:
24

REF: 060105siii

14 ANS:
7

REF: 080105siii

15 ANS:
3

REF: 010211siii

16 ANS:
25

REF: 060207siii

17 ANS:
3

REF: 080208siii

18 ANS:
−7

REF: 010311siii

19 ANS:
14

REF: 060305siii

20 ANS:
7. $f(-3) = (-3)^2 - 6 = 3$. $g(x) = 2^3 - 1 = 7$.

REF: 061135a2

21 ANS:

95. $g(4) = 300(0.8)^4 = 122.88$. $h(122.8) = 70 + 0.2(122.8) = 94.576 \approx 95$

REF: 060526b

22 ANS:

a $y = \dfrac{x-2}{2}$

b 1

REF: 089340siii

23 ANS:

$g(x) = y = 2^x$ $\qquad\qquad\qquad\qquad$ $f(x) = y = x^2$

$g^{-1}(x) = x = 2^y$ $\qquad\qquad\qquad$ $f^{-1}(x) = x = y^2$

$\log x = \log 2^y$ $\qquad\qquad\qquad$ $y = \pm\sqrt{x}$, which is not a function because for

$\log x = y \log 2$ $\qquad\qquad\qquad\qquad$ every value of x, there is not a unique y.

$y = \dfrac{\log x}{\log 2}$, which is a function because

for every value of x, there is a unique y.

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

$g^{-1}(9) \approx \dfrac{\log 9}{\log 2} \approx 3.2$

REF: 010332b