1. If \( f(x) = 5x - 3 \) and \( g(x) = x - 4 \), find \( g(f(-3)) \).

2. If \( f(x) = 5x - 2 \) and \( g(x) = x - 5 \), find \( f(g(2)) \).

3. If \( f(x) = 2x \) and \( g(x) = x + 5 \), find \( g(f(3)) \).


4. Given \( f(x) = \frac{x + 4}{x} \) and \( g(x) = x^2 + 3 \), find \( (g \circ f)(6) \).

[A] \( \frac{52}{9} \)  [B] \( \frac{84}{25} \)  [C] \( \frac{43}{39} \)  [D] \( \frac{14}{3} \)

5. Given \( f(x) = \frac{x + 7}{x} \) and \( g(x) = x^2 + 7 \), find \( (g \circ f)(5) \).

[A] \( \frac{39}{32} \)  [B] \( \frac{1033}{144} \)  [C] \( \frac{319}{25} \)  [D] \( \frac{47}{5} \)

6. If \( g(x) = 2x^2 \) and \( f(x) = 3x + 8 \), find \( g(f(3)) \) and \( f(g(-2)) \).

7. Compare the quantity in Column A with the quantity in Column B.

\[
\begin{array}{ll}
\text{Column A} & \text{Column B} \\
\text{f(2) } & \text{g(f(2))} \\
\text{f(x) = 2x - 5 } & \text{g(x) = } \frac{1}{2}(x + 5) \\
\end{array}
\]

[A] The quantity in Column A is greater.  
[B] The quantity in Column B is greater.  
[C] The two quantities are equal.  
[D] The relationship cannot be determined on the basis of the information supplied.

8. Compare the quantity in Column A with the quantity in Column B.

\[
\begin{array}{ll}
\text{Column A} & \text{Column B} \\
\text{f(x) = x + 2 } & \text{g(x) = 3x - 1} \\
\text{f(g(3)) } & \text{g(f(3))} \\
\end{array}
\]

[A] The quantity in Column A is greater.  
[B] The quantity in Column B is greater.  
[C] The two quantities are equal.  
[D] The relationship cannot be determined on the basis of the information supplied.

9. Write two function rules \( f(x) \) and \( g(x) \) such that \( f(g(-1)) = 6 \).

10. If \( q(x) = 5 - x^2 \) and \( p(q(x)) = \frac{4 - x^2}{x^2} \) when \( x \neq 0 \), then what is \( p\left(\frac{1}{4}\right) \) equal to? Show each of your steps in finding the answer. Explain each of the steps.

11. Find \( g(f(x)) \) where \( f(x) = x - 9 \) and \( g(x) = \frac{x + 2}{2} \).

[A] \( \frac{3x - 16}{2} \)  [B] \( \frac{x - 16}{2} \)  
[C] \( \frac{x - 7}{2} \)  [D] \( \frac{x^2 - 7x - 18}{2} \)

12. Find \( g(f(x)) \) where \( f(x) = x - 5 \) and \( g(x) = \frac{x - 2}{7} \).

[A] \( \frac{x^2 - 7x + 10}{7} \)  [B] \( \frac{x - 37}{7} \)  
[C] \( \frac{8x - 37}{7} \)  [D] \( \frac{x - 7}{7} \)
13. Given \( f(x) = \frac{x+3}{x} \) and \( g(x) = x + 6 \), find \((g \circ f)(x)\) and state the domain.

[A] \( \frac{x+6}{x+9}, \{x|x \neq -9\} \)

[B] \( \frac{x^2 + 7x + 3}{x}, \{x|x \neq 0\} \)

[C] \( \frac{x+9}{x+6}, \{x|x \neq -6\} \)

[D] \( \frac{x^2 + 9x + 18}{x}, \{x|x \neq 0\} \)

14. Given \( f(x) = \frac{x+7}{x} \) and \( g(x) = x + 3 \), find \((g \circ f)(x)\) and state the domain.

[A] \( \frac{x+10}{x+3}, \{x|x \neq -3\} \)

[B] \( \frac{x^2 + 4x + 7}{x}, \{x|x \neq 0\} \)

[C] \( \frac{x+3}{x+10}, \{x|x \neq -10\} \)

[D] \( \frac{x^2 + 10x + 21}{x}, \{x|x \neq 0\} \)

17. Given \( f(x) = \frac{3}{8}x + 4 \) and \( g(x) = x^3 \), find \((g^{-1} \circ g^{-1})(19,683)\).


18. Given \( f(x) = \frac{2}{3}x + 8 \) and \( g(x) = x^3 \), find \((f^{-1} \circ g^{-1})(-8)\). Round to the nearest tenth.


19. Given \( f(x) = \frac{2}{7}x + 1 \) and \( g(x) = x^3 \), find \((f^{-1} \circ f^{-1})(-2)\). Round to the nearest tenth.

20. Given \( f(x) = \frac{1}{6}x + 3 \) and \( g(x) = x^3 \), find \((g^{-1} \circ f^{-1})(-4)\). Round to the nearest tenth.
Precalculus Practice F.BF.A.1: Compositions of Functions

1. \( g(f(-3)) = -22 \)

2. \( f(g(2)) = -17 \)

3. A

4. A

5. C

6. \( g(f(3)) = 578, f(g(-2)) = 32 \)

7. B

8. B

Answers may vary. Sample: \( f(x) = 2x \) and \( g(x) = x + 4 \)

To get \( p\left(\frac{1}{4}\right) \), \( q(x) \) will have to equal \( \frac{1}{4} \).

That means \( 5 - x^2 = \frac{1}{4} \) or \( x^2 = \frac{19}{4} \) which makes \( x = \frac{\sqrt{19}}{2} \). Substituting that into \( p(q(x)) \) gives

\[
p\left(\frac{1}{4}\right) = \frac{4 - \frac{19}{4}}{\frac{19}{4}} = \frac{16 - 19}{19} = -\frac{3}{19}.
\]

OR

Find \( p(x) \) by factoring \( q(x) = 5 - x^2 \) out of \( p(q(x)) \).

\[
p(q(x)) = \frac{4 - x^2}{x^2} = \frac{(5 - x^2) - 1}{5 - (5 - x^2)} \Rightarrow p(x) = \frac{x - 1}{5 - x},
\]

\[
p(x) = \frac{\frac{1}{4} - 1}{5 - \frac{1}{4}} = \frac{-\frac{3}{4}}{\frac{19}{4}} = \frac{-3}{4} \cdot \frac{4}{19} = -\frac{3}{19}.
\]

10. C

11. C

12. D

13. C

14. A