In Exercises 10, find (a) $g(f(3))$, (b) $f \circ g(1)$, and (c) $f(f(0))$

10. $f(x) = 3x - 2$ $\quad g(x) = x^2$

a) $f(3) = 3(3) - 2$
$g(7) = 7^2$
$\boxed{49}$

b) $g(1) = 1^2$
$f(1) = 3(1) - 2$
$\boxed{1}$

c) $f(0) = 3(0) - 2$
$f(-2) = 3(-2) - 2$
$\boxed{-8}$

In Exercises 11-14, write and simplify an equation for $f \circ g$ and $g \circ f$ and find the domain of each.

11. $f(x) = x^2$ $\quad g(x) = x + 3$

$f(g(x)) = (x+3)^2$
D: $\mathbb{R}$

$g(f(x)) = x^2 + 3$
D: $\mathbb{R}$

12. $f(x) = \frac{1}{x}$ $\quad g(x) = \sqrt{x}$

$f(g(x)) = \frac{1}{\sqrt{x}}$
D: $(0, \infty)$

$g(f(x)) = \sqrt{\frac{1}{x}}$
D: $(0, \infty)$

13. $f(x) = x^2 - 5$ $\quad g(x) = \sqrt{4x - 5}$

$f(g(x)) = 4x - 10$
D: $\mathbb{R}$

$g(f(x)) = \sqrt{4x^2 - 25}$
D: $4x^2 - 25 \geq 0$
$(-\infty, -\frac{5}{2}] \cup [\frac{5}{2}, \infty)$

14. $f(x) = \frac{1}{x-2}$ $\quad g(x) = x + 3$

$f(g(x)) = \frac{1}{x+1}$
D: $(-\infty, -1) \cup (-1, \infty)$

$g(f(x)) = \frac{3x-5}{x-2}$
D: $(-\infty, 2) \cup (2, \infty)$

In exercises 15-18, (a) Determine an equation for $f^{-1}(x)$
(b) Identify the domain of f and $f^{-1}(x)$

15. $f(x) = -x + 1$

a. $f^{-1}(x) = -x + 1$
b. $\mathbb{R}$

16. $f(x) = -3x^2 + 5, x \geq 0$

a. $f^{-1}(x) = \sqrt{\frac{x-5}{-3}}$
b. $f(x) \to$ D: $[0, \infty)$
$f^{-1}(x) \to$ D: $(-\infty, 5]$

17. $f(x) = 5 + \sqrt{x - 2}$

a. $f^{-1}(x) = x^2 - 10x + 27$
b. $f(x) \to$ D: $[2, \infty)$
$f^{-1}(x) \to$ D: $[2, \infty)$

18. $f(x) = \frac{1}{x+1}$

a. $f^{-1}(x) = \frac{1-x}{x}$
b. $f(x) \to$ D: $(-\infty, -1) \cup (-1, \infty)$ $\quad f^{-1}(x) \to$ D: $(-\infty, 0) \cup (0, \infty)$

In exercises 19, use composition to show that f and g are inverses of each other.

19. $f(x) = 2x - 6$ $\quad g(x) = \frac{x}{2} + 3$

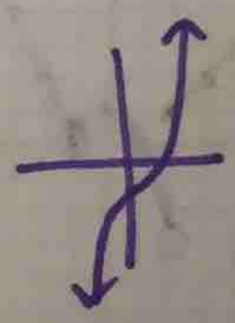
$f(g(x)) = 2(\frac{x}{2} + 3) - 6$
$x + 6 - 6$
$\boxed{x}$ ✓

$g(f(x)) = \frac{2x-6}{2} + 3$
$x - 3 + 3$
$\boxed{x}$ ✓ ☺

In exercises 20-22, determine if the function is one-to-one.

20. $y = x^3 - 1$

Yes



21. $y = |x|$

NO

fails horizontal line test

22. $y = \sin x$ $\quad \cancel{3\left(\frac{2x-5}{2}\right)}$?

NO