[−2, 4] by [−6, 4]

9. **(a)** By the vertical line test, the relation is not a function.
(b) By the horizontal line test, the relation's inverse is a function.

10. **(a)** By the vertical line test, the relation is a function.
(b) By the horizontal line test, the relation's inverse is not a function.

11. **(a)** By the vertical line test, the relation is a function.
(b) By the horizontal line test, the relation's inverse is a function.

12. **(a)** By the vertical line test, the relation is not a function.
(b) By the horizontal line test, the relation's inverse is a function.

13. $y = 3x - 6 \Rightarrow$

$$\begin{aligned} x &= 3y - 6 \\ 3y &= x + 6 \\ f^{-1}(x) = y &= \frac{x+6}{3} = \frac{1}{3}x + 2; (-\infty, \infty) \end{aligned}$$

14. $y = 2x + 5 \Rightarrow$

$$\begin{aligned} x &= 2y + 5 \\ 2y &= x - 5 \\ f^{-1}(x) = y &= \frac{x-5}{2} = \frac{1}{2}x - \frac{5}{2}; \end{aligned}$$

$(-\infty, \infty)$

15. $y = \frac{2x-3}{x+1} \Rightarrow$

$$\begin{aligned} x &= \frac{2y-3}{y+1} \\ x(y+1) &= 2y - 3 \\ xy + x &= 2y - 3 \\ xy - 2y &= -x - 3 \\ y(x-2) &= -(x+3) \\ f^{-1}(x) = y &= -\frac{x+3}{x-2} = \frac{x+3}{2-x}; \end{aligned}$$

$(-\infty, 2) \cup (2, \infty)$

16. $y = \frac{x+3}{x-2} \Rightarrow$

$$\begin{aligned} x &= \frac{y+3}{y-2} \\ x(y-2) &= y + 3 \\ xy - 2x &= y + 3 \\ xy - y &= 2x + 3 \\ y(x-1) &= 2x + 3 \\ f^{-1}(x) = y &= \frac{2x+3}{x-1}; \end{aligned}$$

$x \neq 1$ or $(-\infty, 1) \cup (1, \infty)$

17. $y = \sqrt{x-3}, x \geq 3, y \geq 0 \Rightarrow$

$$\begin{aligned} x &= \sqrt{y-3}, && x \geq 0, y \geq 3 \\ x^2 &= y - 3, && x \geq 0, y \geq 3 \\ f^{-1}(x) &= y = x^2 + 3, && x \geq 0 \text{ or } [0, \infty) \end{aligned}$$

18. $y = \sqrt{x+2}, x \ge -2, y \ge 0 \Rightarrow$
$$x = \sqrt{y+2}, \quad x \ge 0, y \ge -2$$
$$x^2 = y + 2, \quad x \ge 0, y \ge -2$$
$$f^{-1}(x) = y = x^2 - 2, \quad x \ge 0, \text{or } [0, \infty)$$

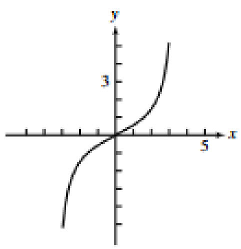
19. $y = x^3 \Rightarrow \quad x = y^3$
$$f^{-1}(x) = y = \sqrt[3]{x}; (-\infty, \infty)$$

20. $y = \sqrt{x^3+5} \Rightarrow \quad x = \sqrt{y^3+5}$
$$x^2 = y^3 + 5$$
$$x^2 - 5 = y^3$$
$$f^{-1}(x) = y = \sqrt[3]{x^2-5}; [0, \infty)$$

21. $y = \sqrt[3]{x+5} \Rightarrow \quad x = \sqrt[3]{y+5}$
$$x^3 = y + 5$$
$$f^{-1}(x) = y = x^3 - 5; (-\infty, \infty)$$

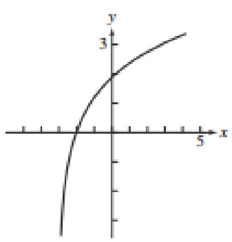
22. $y = \sqrt[3]{x-2} \Rightarrow \quad x = \sqrt[3]{y-2}$
$$x^3 = y - 2$$
$$f^{-1}(x) = y = x^3 + 2; (-\infty, \infty)$$

23. One-to-one



24. Not one-to-one

25. One-to-one



26. Not one-to-one

27. $f(g(x)) = 3\left[\frac{1}{3}(x+2)\right] - 2 = x + 2 - 2 = x;$

$g(f(x)) = \frac{1}{3}[(3x-2)+2] = \frac{1}{3}(3x) = x$

28. $f(g(x)) = \frac{1}{4}[(4x-3)+3] = \frac{1}{4}(4x) = x;$

$g(f(x)) = 4\left[\frac{1}{4}(x+3)\right] - 3 = x + 3 - 3 = x$

29. $f(g(x)) = [(x-1)^{1/3}]^3 + 1 = (x-1)^1 + 1$
$= x - 1 + 1 = x;$

$g(f(x)) = [(x^3+1)-1]^{1/3} = (x^3)^{1/3} = x^1 = x$

30. $f(g(x)) = \dfrac{7}{\frac{7}{x}} = \dfrac{7}{1}\cdot\dfrac{x}{7} = x; \quad g(f(x)) = \dfrac{7}{\frac{7}{x}} = \dfrac{7}{1}\cdot\dfrac{x}{7} = x$

31. $f(g(x)) = \dfrac{\frac{1}{x-1}+1}{\frac{1}{x-1}} = (x-1)\left(\dfrac{1}{x-1}+1\right)$
$= 1 + x - 1 = x;$

$g(f(x)) = \dfrac{1}{\frac{x+1}{x}-1} = \left(\dfrac{1}{\frac{x+1}{x}-1}\right)\cdot\dfrac{x}{x}$

$= \dfrac{x}{x+1-x} = \dfrac{x}{1} = x$

32. $f(g(x)) = \dfrac{\frac{2x+3}{x-1}+3}{\frac{2x+3}{x-1}-2} = \left(\dfrac{\frac{2x+3}{x-1}+3}{\frac{2x+3}{x-1}-2}\right)\cdot\left(\dfrac{x-1}{x-1}\right)$

$= \dfrac{2x+3+3(x-1)}{2x+3-2(x-1)} = \dfrac{5x}{5} = x;$

$g(f(x)) = \dfrac{2\left(\frac{x+3}{x-2}\right)+3}{\frac{x+3}{x-2}-1}$

$= \left[\dfrac{2(\frac{x+3}{x-2})+3}{\frac{x+3}{x-2}-1}\right]\cdot\dfrac{x-2}{x-2}$

$= \dfrac{2(x+3)+3(x-2)}{x+3-(x-2)} = \dfrac{5x}{5} = x$

33. **(a)** $y = (0.76)(100) = 76$ euros

(b) $x = \dfrac{y}{0.76} = \dfrac{25}{19}y$. This converts euros ($x$) to dollars ($y$).

(c) $x = \dfrac{48}{0.76} = \$63.16$

34. **(a)** $9c(x) = 5(x-32)$

$\frac{9}{5}c(x) = x - 32$

$\frac{9}{5}c(x) + 32 = x$

In this case, $c(x)$ becomes x, and x becomes $c^{-1}(x)$ for the inverse. So, $c^{-1}(x) = \frac{9}{5}x + 32$. This converts Celsius temperature to Fahrenheit temperature.

(b) $(k \circ c)(x) = k(c(x)) = k\left(\frac{5}{9}\left(x - 32\right)\right)$

$\frac{5}{9}(x-32) + 273.16 = \frac{5}{9}x + 255.38$. This is used to convert Fahrenheit temperature to Kelvin temperature.

35. $y = e^x$ and $y = \ln x$ are inverses. If we restrict the domain of the function $y = x^2$ to the interval $[0, \infty)$, then the restricted function and $y = \sqrt{x}$ are inverses.

36. $y = x$ and $y = 1/x$ are their own inverses.

37. $y = |x|$

38. $y = x$

39. True. All the ordered pairs swap domain and range values.

40. True. This is a parametrization of the line $y = 2x + 1$.

41. The inverse of the relation given by $x^2y + 5y = 9$ is the relation given by $y^2x + 5x = 9$.

$(1)^2(2) + 5(2) = 2 + 10 = 12 \neq 9$

$(1)^2(-2) + 5(-2) = -2 - 10 = -12 \neq 9$

$(2)^2(-1) + 5(-1) = -4 - 5 = -9 \neq 9$

$(-1)^2(2) + 5(2) = 2 + 10 = 12 \neq 9$

$(-2)^2(1) + 5(1) = 4 + 5 = 9$

The answer is E.

42. The inverse of the relation given by $xy^2 - 3x = 12$ is the relation given by $yx^2 - 3y = 12$.

$(-4)(0)^2 - 3(-4) = 0 + 12 = 12$

$(1)(4)^2 - 3(1) = 16 - 3 = 13 \neq 12$

$(2)(3)^2 - 3(2) = 18 - 6 = 12$

$(12)(2)^2 - 3(12) = 48 - 36 = 12$

$(-6)(1)^2 - 3(-6) = -6 + 18 = 12$

The answer is B.

43. $f(x) = 3x - 2$

$y = 3x - 2$

The inverse relation is

$x = 3y - 2$

$x + 2 = 3y$

$\frac{x + 2}{3} = y$

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

The answer is C.

44. $f(x) = x^3 + 1$