Chapter 1 Test

1. (b), (c), and (d) are not functions.

2. **a.** $f(4) - f(-3) = 3 - (-2) = 5$

b. domain: $(-5, 6]$

c. range: $[-4, 5]$

d. increasing: $(-1, 2)$

e. decreasing: $(-5, -1)$ or $(2, 6)$

f. $2, f(2) = 5$

g. $(-1, -4)$

h. x-intercepts: -4, 1, and 5.

i. y-intercept: -3

3. **a.** $-2, 2$

b. $-1, 1$

c. 0

d. even; $f(-x) = f(x)$

e. no; f fails the horizontal line test

f. $f(0)$ is a relative minimum.

82. Horizontal shift left 2 units; vertical shift down 1 unit

83. vertical reflection (across x-axis); horizontal compression by a factor of 1/2

84. . vertical reflection (across x-axis); vertical stretch by a factor of 2, horizontal reflection (across y-axis)

85. domain: $(-\infty, \infty)$

86. The denominator is zero when $x = 7$. The domain is $(-\infty, 7) \cup (7, \infty)$.

87. The expressions under each radical must not be negative.
$8 - 2x \geq 0$
$-2x \geq -8$
$x \leq 4$
domain: $(-\infty, 4]$.

93. $f(x) = \sqrt{x+7};\ g(x) = \sqrt{x-2}$

$(f+g)(x) = \sqrt{x+7} + \sqrt{x-2}$
domain: $[2, \infty)$

$(f-g)(x) = \sqrt{x+7} - \sqrt{x-2}$
domain: $[2, \infty)$

$(fg)(x) = \sqrt{x+7} \cdot \sqrt{x-2}$
$= \sqrt{x^2 + 5x - 14}$
domain: $[2, \infty)$

$\left(\frac{f}{g}\right)(x) = \frac{\sqrt{x+7}}{\sqrt{x-2}}$
domain: $(2, \infty)$

94. $f(x) = x^2 + 3;\ g(x) = 4x - 1$

a. $(f \circ g)(x) = (4x-1)^2 + 3$
$= 16x^2 - 8x + 4$

b. $(g \circ f)(x) = 4(x^2 + 3) - 1$
$= 4x^2 + 11$

c. $(f \circ g)(3) = 16(3)^2 - 8(3) + 4 = 124$

102. a.

$$\begin{aligned} f(x) &= 4x - 3 \\ y &= 4x - 3 \\ x &= 4y - 3 \\ y &= \frac{x+3}{4} \\ f^{-1}(x) &= \frac{x+3}{4} \end{aligned}$$

b.

$$\begin{aligned} f(f^{-1}(x)) &= 4\left(\frac{x+3}{4}\right) - 3 \\ &= x + 3 - 3 \\ &= x \end{aligned}$$

$$f^{-1}(f(x)) = \frac{(4x-3)+3}{4} = \frac{4x}{4} = x$$