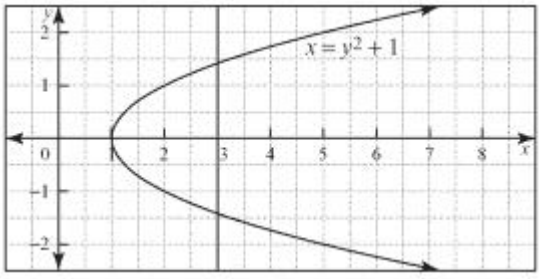
Chapter 1 – Functions – REVIEW
MCR3U
Jensen

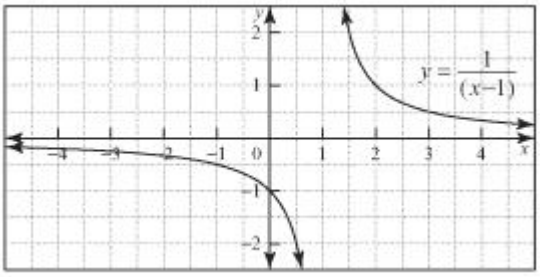
Section 1: Functions, Domain, and Range

1) State the domain and range of the following relations and then state if it is a function or not.

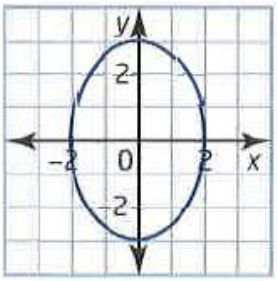
a)



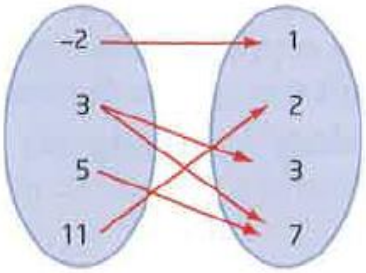
b)



c)



d)



e) $\{(1,4),(2,6),(3,10),(4,18),(5,29)\}$

f) $y = 3(x-1)^2 + 4$

Section 2: Max or Min of a Quadratic Function

2) Determine the vertex for each quadratic function by completing the square. State if the vertex is a maximum or a minimum.

a) $f(x) = x^2 - 10x + 7$

b) $f(x) = x^2 + 2x + 6$

c) $f(x) = 3x^2 - 30x + 73$

d) $f(x) = -2x^2 - 8x + 7$

3) Use partial factoring to determine the vertex of each function. State if the vertex is a max or min.

a) $y = -x^2 + 4x + 11$

b) $y = 3x^2 - 18x + 14$

c) $y = 5x^2 + 14x - 21$

d) $y = -2x^2 - 11x + 1$

4) A hall charges \$30 per person for a sports banquet when 120 attend. For every 10 extra people that attend, the hall will decrease the price by \$1.50 per person. What number of people will maximize the revenue for the hall?

5) The power, P, in watts, produced by a solar panel is given by the function $P(I) = -5I^2 + 100I$, where I represents the current, in amperes.

a) What value of the current will maximize the power?

b) What is the maximum power?

6) a) Find the vertex of the parabola defined by $f(x) = -\frac{1}{3}x^2 + 2x - 4$.

b) Is the vertex a minimum or a maximum?

c) Without finding them, how many *x*-intercepts does the parabola have? Explain.

Section 3: Radicals

7) Perform each radical operation and simplify where needed.

a) $\sqrt{27} - 4\sqrt{3} + \sqrt{243} - 8\sqrt{81} + 2$

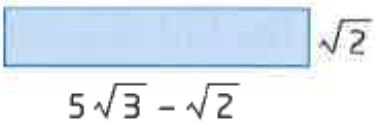
b) $-3\sqrt{3}(\sqrt{3} + 5\sqrt{2})$

c) $(5 + \sqrt{3})(5 - \sqrt{3})$

d) $5\sqrt{2}(11 + 2\sqrt{2}) - 4(8 + 3\sqrt{2})$

8) Find a simplified expression for the area of each shape

a)



b)

Section 4: Solve Quadratics by Factoring

9) Solve each of the following quadratic equations by factoring.

a) $x^2 + 4x - 21 = 0$

b) $5x^2 - 19x - 4 = 0$

c) $4x^2 + 12x = -9$

Section 5: Solve Quadratics Using the Quadratic Formula

10) Solve each quadratic equation. Give exact answers.

a) $f(x) = 2x^2 - 9x - 1$

b) $g(x) = -3x^2 + 4x + 2$

11) Solve each quadratic equation using any method.

a) $3x^2 - 15x = 42$

b) $5x^2 + 11x + 1 = 0$

12) Use the discriminant to predict the number of real roots of…

a) $f(x) = x^2 + 3x + 3$

b) $f(x) = -2x^2 + 4x - 2$

c) $f(x) = 2x^2 + 5x - 8$

Section 6: Determine a Quadratic Equation Given its Roots

13) Determine the equation in standard form for each quadratic function…

a) x-intercepts -2 and 5, containing the point (3, 5)

b) x-intercepts $-2 \pm \sqrt{5}$, containing the point (-4, 5)

14) A golf ball is hit, and it lands at a point on the same horizontal plane 53 meters away. The path of the ball took it just over a 9 meter tall tree that was 8 meters in front of the golfer.

a) Assume the ball is hit from the origin of a coordinate plane. Find a quadratic function that describes the path of the ball.

b) What is the maximum height of the ball?

Section 7: Linear-Quadratic Systems

15) Determine the points of intersection of each pair of functions.

a) $f(x) = 4x^2 - 15x + 20$ and $g(x) = 5x - 4$

b) $f(x) = -2x^2 + 9x + 9$ and $g(x) = -3x - 5$

16) For what value of b will the line $y = -2x + k$ be tangent to the parabola $y = 3x^2 + 4x - 1$

Answers

1) a) domain: $\{X \in \mathbb{R} | x \geq 1\}$ range: $\{Y \in \mathbb{R}\}$ **b)** domain: $\{X \in \mathbb{R} | x \neq 1\}$ range: $\{Y \in \mathbb{R} | y \neq 0\}$

c) domain: $\{X \in \mathbb{R} | -2 \leq x \leq 2\}$ range: $\{Y \in \mathbb{R} | -3 \leq y \leq 3\}$

d) domain: $\{-2, 3, 5, 11\}$, range $\{1, 2, 3, 7\}$ **e)** domain: $\{1, 2, 3, 4, 5\}$, range: $\{4, 6, 10, 18, 29\}$

f) domain:$\{X \in \mathbb{R}\}$, range: $\{Y \in \mathbb{R} | y \geq 4\}$

2) a) (5, -18) min **b)** (-1, 5) min **c)** (5, -2) min **d)** (-2, 15) max

3) a) (2, 15) max **b)** (3, -13) min **c)** (-1.4, -30.8) min **d)** $\left(-\frac{11}{4}, \frac{129}{8}\right)$ max

4) 160

5) a) 10 A **b)** 500 W

6) a) (3, -1) **b)** max **c)** vertex is below x-axis and opens down, therefore no x-intercepts

7) a) $-70 + 8\sqrt{3}$ **b)** $-9 - 15\sqrt{6}$ **c)** 22 **d)** $-12 + 43\sqrt{2}$

8) a) $5\sqrt{6} - 2$ square units **b)** $\frac{27\pi}{2}$ square units

9) a) -7 and 3 **b)** $-\frac{1}{5}$ and 4 **c)** $-\frac{3}{2}$

10) a) $x = \frac{9+\sqrt{89}}{4}, x = \frac{9-\sqrt{89}}{4}$ **b)** $x = \frac{2-\sqrt{10}}{3}, x = \frac{2+\sqrt{10}}{3}$

11) a) $x = 7$ and $x = -2$ **b)** $x = \frac{-11 \pm \sqrt{101}}{10}$

12) a) none **b)** 1 **c)** 2

13) a) $f(x) = -\frac{1}{2}x^2 + \frac{3}{2}x + 5$ **b)** $f(x) = -5x^2 - 20x + 5$

14) a) $f(x) = -\frac{1}{40}x^2 + \frac{53}{40}x$ **b)** 17.6 m

15) a) (2, 6), (3, 11) **b)** (-1, -2), (7, -26)

16) $k = -4$