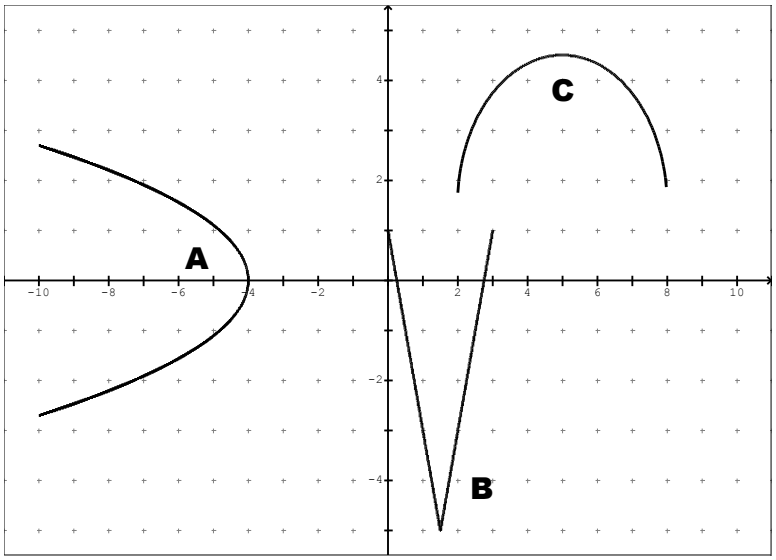
Exam Review Chapter 1 – Functions

MCR3U

Jensen

Section 1: Functions, Domain, and Range

1)



a) List which graphs above are the graphs of functions, and which are not.

b) Describe how you can tell whether a given graph is the graph of a function.

c) For graph **B**, if $y = f(x)$, what is the value of $f(3)$?

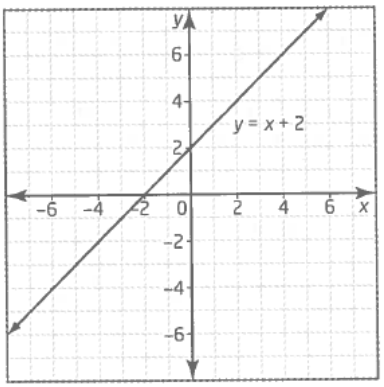
2) State the domain and range of each relation. Is each relation a function? Justify your answer.

a) {(-6, 2), (-5, 2), (-4, 2), (-3, 2)}

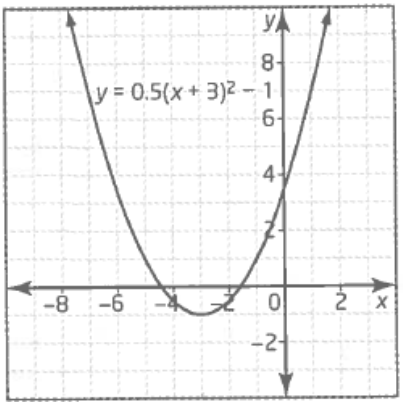
b) {(5, -4), (5, -2), (5, 0), (5, 2), (5, 4)}

3) State the domain and range for each relation. Determine if each relation is a function.

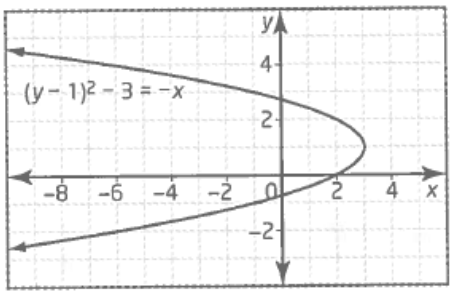
a)



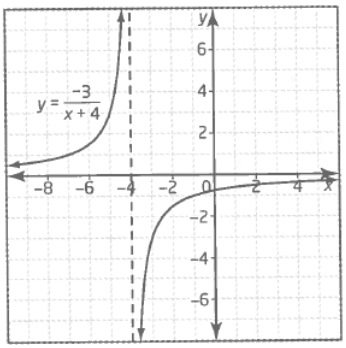
b)



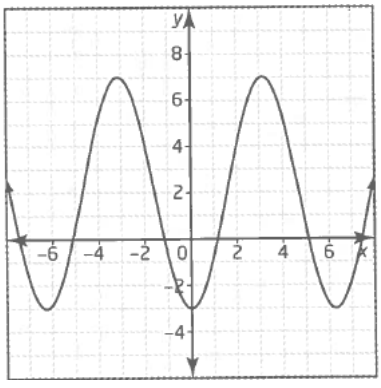
c)



d)



e)



Section 2: Function Notation

4) Suppose $f(x) = -2x^2 + 6$. Find each of the following and simplify.

a) $f(5)$ **b)** $f(0)$ **c)** $f(\frac{3}{4})$

5) For each function below, determine $f(-2), f(1), f\left(\frac{1}{2}\right)$

a) $f(x) = -\frac{3}{5}x + 2$ **b)** $f(x) = \sqrt{3 - 2x}$

Section 3: Max or Min of a Quadratic

6) Complete the square to determine the coordinates of the vertex. State if the vertex is a minimum or a maximum.

a) $f(x) = x^2 + 4x + 1$ **b)** $f(x) = -2x^2 + 12x + 7$

c) $f(x) = \frac{3}{4}x^2 - 3x + 6$

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

a) $f(x) = 4x^2 - 8x + 1$

b) $f(x) = -\frac{1}{2}x^2 - 4x - 3$

8) Convert the parabola, $y = 3x^2 + 15x - 5$ into vertex form using any method. State if the vertex is a min or max point.

9) A farmer has 5000 meters of fencing to enclose a rectangular field and subdivide it into three equal plots. The enclosed area is to be a maximum. Determine the dimensions of one plot of land, to the nearest meter.

10) The student council is organizing a trip to a rock concert. All proceeds from ticket sales will be donated to charity. Tickets to the concert cost $31.25 per person if a minimum of 104 people attend. For every 8 extra people that attend, the price will decrease by $1.25 per person.

a) How many tickets need to be sold to maximize the donation to charity?

b) What is the price of each ticket that maximizes the donation?

c) What is the maximum donation?

11) A ball is kicked into the air. It follows a path given by $h(t) = -4.9t^2 + 8t + 0.4$, where t is the time, in seconds, and $h(t)$ is the height, in meters.

a) Determine the maximum height of the ball to the nearest tenth of a meter.

b) When does the ball reach its maximum height?

Section 4: Radicals

12) Simplify

a) $2(7\sqrt{3})$ b) $\sqrt{5}(3\sqrt{6})$ c) $-3\sqrt{3}(5\sqrt{2})$

13) Express each as a mixed radical in simplest form

a) $\sqrt{54}$ **b)** $\sqrt{84}$ **c)** $\sqrt{18}$ **d)** $\sqrt{48}$

14) Simplify each radical first, and then add or subtract

a) $5\sqrt{12} - 2\sqrt{48} - 7\sqrt{75}$

b) $\sqrt{20} - 3\sqrt{245} - 2\sqrt{20}$

c) $9\sqrt{5} + 8\sqrt{6} - 13\sqrt{5} + 19\sqrt{6} + 4\sqrt{6}$

d) $2\sqrt{12} + 4\sqrt{20} - 3\sqrt{27} - 5\sqrt{45}$

15) Expand. Simplify where possible.

a) $\sqrt{2}(\sqrt{6} - \sqrt{3})$

b) $6\sqrt{6}(3\sqrt{2} - 4\sqrt{3})$

c) $(\sqrt{7} - 6)(\sqrt{7} + 1)$

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

Section 5: Solving Quadratics

16) Solve each quadratic by factoring

a) $f(x) = x^2 + 7x + 12$

b) $f(x) = 3x^2 - 4x - 15$

17) Solve each quadratic using the quadratic formula

a) $f(x) = 3x^2 + 6x + 1$

b) $f(x) = x^2 + 6x + 4$

18) Use the discriminant to determine the number of roots for each quadratic equation

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

b) $f(x) = 2x^2 - 5x + 7$

c) $f(x) = 4x^2 + 24x + 36$

Section 6: Linear-Quadratic Systems

19) Determine algebraically the coordinates of the points of intersection of each pair of functions.

a) $y = x^2 + 4x + 3$ and $y = 5x + 9$

b) $y = -x^2 - 4x + 6$ and $y = x - 8$

20) Given the equation of a parabola and the slope of a line that is tangent to the parabola, determine the y-intercept of the tangent line.

$f(x) = -3x^2 + x - 4$, tangent line has slope 13

Answers

1) a) B&C are functions, A is not a function **b)** vertical line test: each value of x has only 1 value of y **c)** $f(3) = 1$

2) a) D: $\{x = -6, -5, -4, -3\}$; R: $\{y = 2\}$; is a function **b)** D: $\{x = 5\}$; R: $\{y = -4, -2, 0, 2, 4\}$; not a function

3) a) D: $\{x \in \mathbb{R}\}$; R: $\{y \in \mathbb{R}\}$; is a function **b)** D: $\{x \in \mathbb{R}\}$; R: $\{y \in \mathbb{R} | y \geq -1\}$, is a function

c) D: $\{x \in \mathbb{R} | x \leq 3\}$; R: $\{y \in \mathbb{R}\}$; not a function **d)** D: $\{x \in \mathbb{R} | x \neq -4\}$; R: $\{y \in \mathbb{R} | y \neq 0\}$; is a function

e) D: $\{x \in \mathbb{R}\}$; R: $\{y \in \mathbb{R} | -3 \leq y \leq 7\}$; is a function

4) a) -44 **b)** 6 **c)** $\frac{39}{8}$

5) a) $\frac{16}{5}, \frac{7}{5}, \frac{17}{10}$ **b)** $\sqrt{7}, 1, \sqrt{2}$

6) a) (-2, -3) min **b)** (3, 25) max **c)** (2, 3) min

7) a) (1, -3) min **b)** (-4, 5) max

8) $\left(-\frac{5}{2}, -\frac{95}{4}\right)$ min

9) 260 625 m^2

10) a) 152 tickets **b)** \$23.75 **c)** \$3610

11) a) 3.7 m **b)** 0.8 s

12) a) $14\sqrt{3}$ **b)** $3\sqrt{30}$ **c)** $-15\sqrt{6}$

13) a) $3\sqrt{6}$ **b)** $2\sqrt{21}$ **c)** $3\sqrt{2}$ **d)** $4\sqrt{3}$

14) a) $-33\sqrt{3}$ **b)** $-23\sqrt{5}$ **c)** $-4\sqrt{5} + 31\sqrt{6}$ **d)** $-5\sqrt{3} - 7\sqrt{5}$

15) a) $2\sqrt{3} - \sqrt{6}$ **b)** $36\sqrt{3} - 72\sqrt{2}$ **c)** $1 - 5\sqrt{7}$ **d)** 33

16) a) -3 and -4 **b)** $-\frac{5}{3}$ and 3

17) a) $x = \frac{-3 \pm \sqrt{6}}{3}$ **b)** $x = -3 \pm \sqrt{5}$

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

19) a) (3, 24), (-2, -1) **b)** (-7, -15), (2, -6)

20) 8