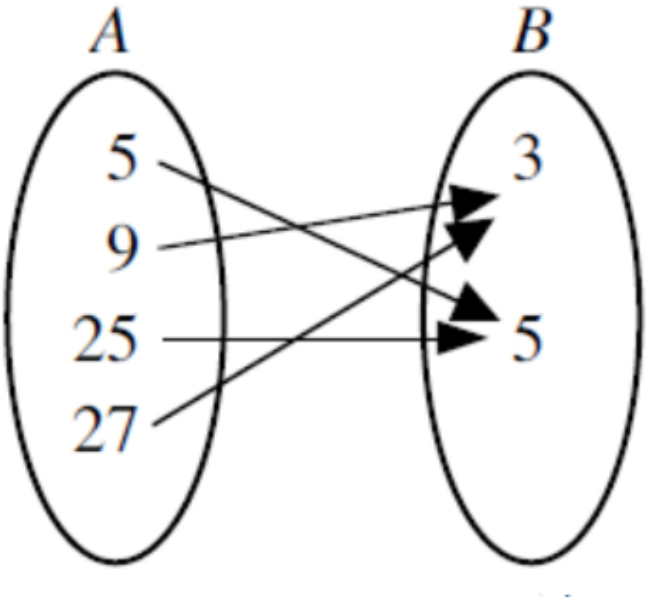
# Lesson 3: Inverse Functions

## Question #1

*Reference Q.11255*

The arrow diagram shows a function from set A to set B.




a. Draw an arrow diagram which represents the inverse of this function.

b. Is the inverse of the function also a function?

## Question #2

*Reference Q.11256*

Complete the table to describe the inverse of the function:

| FUNCTION | INVERSE | Is the inverse a function? |
|---|---|---|
| divide by 3 | _____ | _____ |
| cube | _____ | _____ |
| add 10, then multiply by 2 | _____ | _____ |
| square, then subtract 5 | _____ | _____ |

## Question #3

*Reference Q.11258*

Consider the function defined by the following set of ordered pairs:

$\{(-2, 9), (-1, 7), (0, 5), (1, 3), (2, 1)\}$

a. Describe the inverse of the function by a set of ordered pairs.

b. Is the inverse of the functon also a function? Why?

## Question #4

*Reference Q.11259*

Consider the function defined by the following set of ordered pairs:

$\{(-2, 1), (-1, -2), (0, -3), (1, -2), (2, 1)\}$

a. Describe the inverse of the function by a set of ordered pairs.

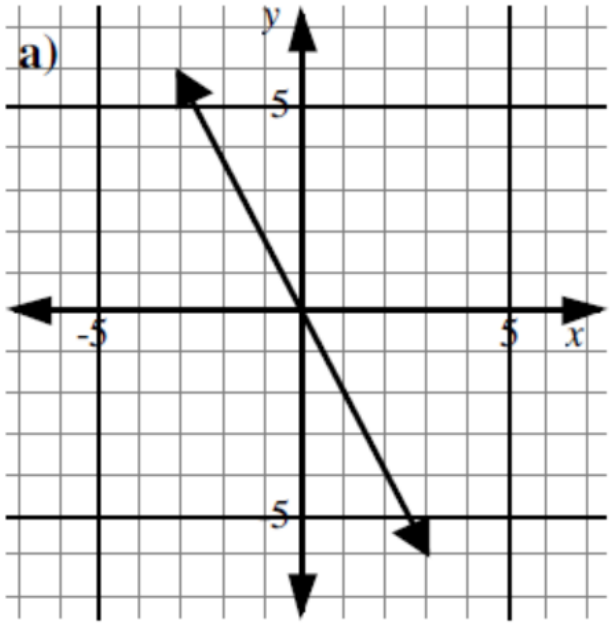
b. Is the inverse of the function also a function? Why?

## Question #5

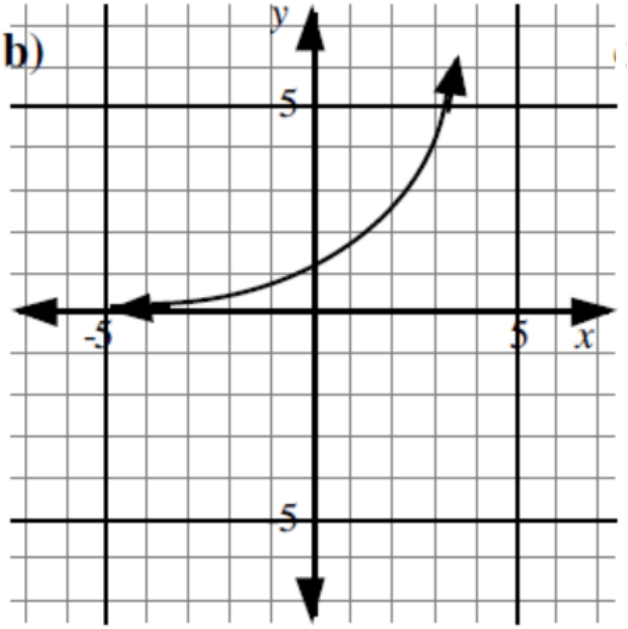
*Reference Q.11260*

Sketch the graph of the inverse of the function defined by the following graphs. Is the inverse a function?

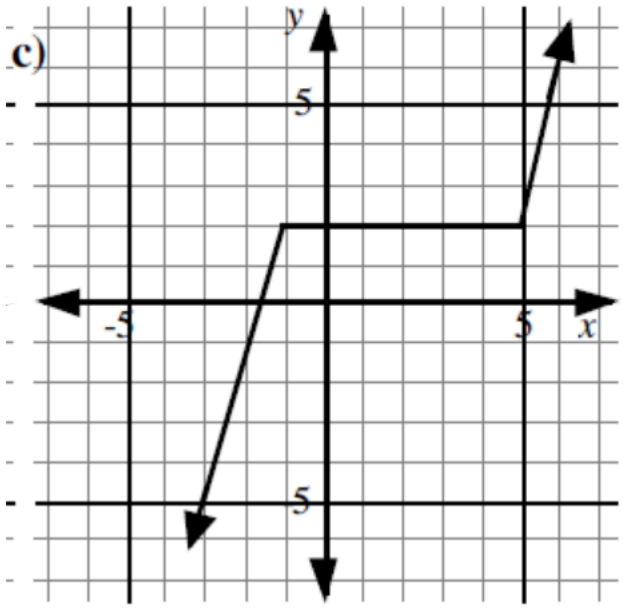
a.




b.




c.




## Question #6

*Reference Q.11261*

Find the inverse of the functions defined by the following equations.

a. $y = \frac{1}{3}x - 2$

b. $y = 6 - 8x$

c. $y = \frac{x - 2}{5}$

d. $3y = x - 7$

e. $6x - \frac{1}{2}y + 4 = 0$

f. $y = x^2$

## Question #7

*Reference Q.11262*

Graph the inverse of the following functions using a graphing calculator.

a. $y = 4x - 8$

b. $y = |x + 2|$

c. $y = x^2 + 3$

## Question #8

*Reference Q.11263*
In each case, graph the function defined by the equation and the inverse of the function on the same grid.

a. $y = 9 - x^2$

b. $y = \sqrt{x - 4}$

## Question #9

*Reference Q.11264*
When a function and its inverse are graphed on the same grid, which of the following lines must be a line of symmetry for the graph?

A. the x-axis
B. the y-axis
C. the line $y = x$
D. the line $y = -x$

## Question #10

*Reference Q.11265*
A function is defined by the equations $y = 2x^2 - 3.$ The inverse of the function has the equation:

A. $y = \dfrac{x + 3}{2}$
B. $y = 3 - 2x^2$
C. $y = \pm\sqrt{\dfrac{x + 3}{2}}$
D. $y = \pm\sqrt{\dfrac{2}{x + 3}}$

## Question #11

*Reference Q.11266*
The point $(a, 2)$ lies on the graph of a function and on the graph of the inverse of the function. The value of a is:

A. $2$
B. $0$
C. $-2$
D. Impossible to determine without further information

## Question #12

*Reference Q.11271*
Use function notation to write the inverse of the following functions.

a. $f(x) = 4x + 5$

b. $g(x) = \dfrac{3x - 1}{7}$

c. $h(x) = x^3 - 1$

## Question #13

*Reference Q.11272*

a. Graph the function $f(x) = x^2 + 4$ and its inverse function.

b. Find the equation of the inverse function in the form $x = f(y)$ and solve for y.

## Question #14

*Reference Q.11273*
For each of the following functions

- Determine the inverse using the notation $f^{-1}(x),$ where appropriate
- State the domain and range of the inverse

a. $f(x) = \sqrt{x + 2}$

b. $f(x) = (x - 2)^2$

c. $f(x) = x^2 - 25$

d. $f(x) = \sqrt{16 - x^2}$

## Question #15

*Reference Q.11274*

In each of the following

i) sketch the graphs of $y = f(x)$ and $y = f^{-1}(x)$

ii) determine $y = f^{-1}(x)$

a. $f(x) = x^2, x \geq 0$

ii. Sketch the graphs of $y = f(x)$ and $y = f^{-1}(x)$ on the same grid.

iii. Determine $y = f^{-1}(x)$.

b. $f(x) = (x-4)^2, x \geq 4$

iii. Sketch the graphs of $y = f(x)$ and $y = f^{-1}(x)$ on the same grid.

iv. Determine $y = f^{-1}(x)$.

c. $f(x) = x^2 + 2, x \leq 0$

iv. Sketch the graphs of $y = f(x)$ and $y = f^{-1}(x)$ on the same grid.

v. Determine $y = f^{-1}(x)$.

## Question #16

*Reference Q.11505*

Kaleb incorrectly determined the inverse of $y = 4 - \sqrt{-x}$ to be $y = -(x-4)^2$ and used the graphing calculator to obtain a parabola. Explain why the graph of the correct inverse is not a complete parabola.

## Question #17

*Reference Q.11506*

Functions f and g are defined as $f(x) = 2x + 6$ and $g(x) = 3x$.

a. Determine $f^{-1}(x)$ and $g^{-1}(x)$.

b. Find expressions for:

iii. $(f^{-1} \circ g^{-1})(x)$

iv. $(g^{-1} \circ f^{-1})(x)$

v. $(f \circ g)^{-1}(x)$

vi. $(g \circ f)^{-1}(x)$

c. Compare the answers in b). What do you notice?

## Question #18

*Reference Q.11507*

Given that $f(x) = 1 - 2x, x \in \mathbb{R}$ then $f^{-1}(x)$ is

A. $-\frac{x}{2} - 1$

B. $\frac{x}{2} - 1$

C. $\frac{1-x}{2}$

D. $\frac{x-1}{2}$

## Question #19

*Reference Q.11509*

Given that $f(x) = 2x$ and $g(x) = 3 - 5x$, then $(g \circ f)^{-1}(x)$ equals

A. $\frac{3}{11}$

B. $\frac{6}{11}$

C. $\frac{1}{10}(3-x)$

D. $\frac{1}{10}(6-x)$

## Question #20

*Reference Q.11510*

The graph of $y = P(x)$ passes through the points, $(14, 2), (2, 15),$ and $\left(\frac{1}{2}, 10\right)$.

The value of $P^{-1}(2)$ is _____.