Name: _____

Work on as many problems as you can together with your group members. Towards the end of lecture your group will be asked to present problems correctly to receive classwork points.

1. Determine whether the following relations represent a function. If so, find the domain and range. If not, state why.

   (a) $\{(-9,-4),(9,-2),(5,5),(-2,-2)\}$

   (b) $\{(-9,-4),(-9,2),(-5,5),(2,-2)\}$

   (c) $\{(-9,-5),(9,-2),(5,5),(-5,-2)\}$

   (d) $\{(-9,-4),(9,-2),(-5,5),(-5,-2)\}$

   (e) $\{(-9,-4),(9,-2),(5,-4),(-2,-2)\}$

   **Solution**

   (a) Yes

   (b) No, $-9$ gets mapped to both $-4$ and $2$

   (c) Yes

   (d) No, $-5$ gets mapped to both $5$ and $-2$

   (e) Yes

   □

2. Determine whether the following equations define $y$ as a function of $x$.

   (a) $x^2 + y = 100$

   (b) $x = y^2$

   (c) $x^2 + y^2 = 9$

   (d) $\sqrt{x} + 2y = 1$

   (e) $y^3 = x$

   **Solution**

   (a)
$$x^2 + y = 100 \Leftrightarrow y = 100 - x^2$$

   Yes, it is a function

   (b)
$$x = y^2 \Leftrightarrow y = \pm\sqrt{x}$$

   No, it is not a function

   (c)
$$x^2 + y^2 = 9 \Leftrightarrow y^2 = 9 - x^2 \Leftrightarrow y = \pm\sqrt{9 - x^2}$$

   Yes, it is a function

   (d)
$$\sqrt{x} + 2y = 1 \Leftrightarrow 2y = 1 - \sqrt{x} \Leftrightarrow y = \frac{1 - \sqrt{x}}{2}$$

   Yes, it is a function

   (e)
$$y^3 = x \Leftrightarrow y = \sqrt[3]{x}$$

   Yes, it is a function

3. Evaluate the function $f(x) = 8x + 6$ at the given values of the independent variable and simplify.

    (a) $f(7)$ and $f(x + 2)$
    (b) $f(5)$ and $f(x + 4)$
    (c) $f(-2)$ and $f(-x)$
    (d) $f(x + 2) - f(x)$
    (e) $f(4)$ and $f(x^2)$

**Solution**

    (a)

$$f(7) = 8(7) + 6$$
$$= 56 + 6$$
$$= \boxed{62}$$

$$f(x + 2) = 8(x + 2) + 6$$
$$= 8x + 16 + 6$$
$$= \boxed{8x + 22}$$

    (b)

$$f(5) = 8(5) + 6$$
$$= 40 + 6$$
$$= \boxed{46}$$

$$f(x + 4) = 8(x + 4) + 6$$
$$= 8x + 32 + 6$$
$$= \boxed{8x + 38}$$

    (c)

$$f(-2) = 8(-2) + 6$$
$$= -16 + 6$$
$$= \boxed{-10}$$

$$f(-x) = 8(-x) + 6$$
$$= -8x + 6$$

    (d)

$$f(x + 2) - f(x) = [8(x + 2) + 6] - [8x + 6]$$
$$= \cancel{8x} + 16 + \cancel{6} - \cancel{8x} - \cancel{6}$$
$$= \boxed{16}$$

(e)

$$f(4) = 8(4) + 6$$
$$= 32 + 6$$
$$= \boxed{38}$$

$$f(x^2) = 8(x^2) + 6$$
$$= \boxed{8x^2 + 6}$$

$\square$

4. Graph the given functions, $f$ and $g$, in the same rectangular coordinate system. Then describe how the graph of $g$ is related to the graph of $f$.

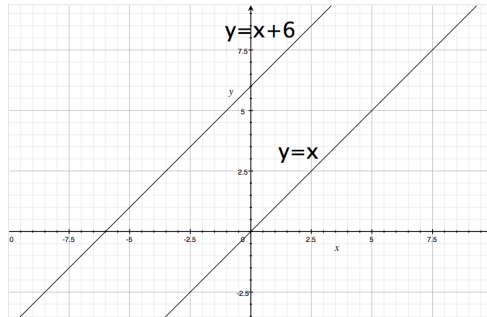(a) $f(x) = x$ and $g(x) = x + 6$

(b) $f(x) = x$ and $g(x) = x - 2$

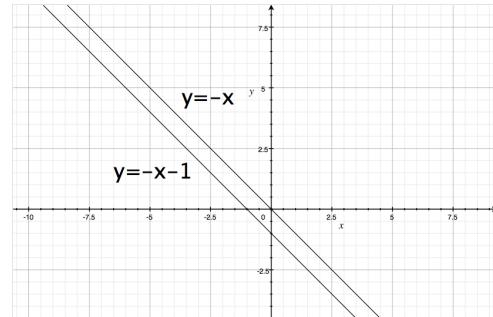(c) $f(x) = -x$ and $g(x) = -x + 3$
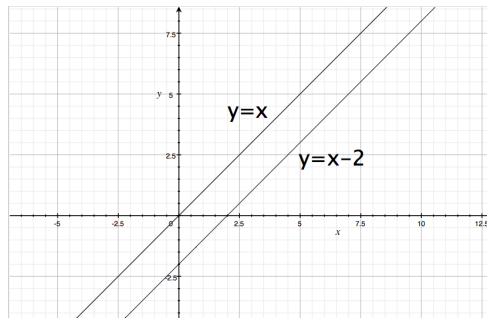
(d) $f(x) = -x$ and $g(x) = -x - 1$

(e) $f(x) = x + 1$ and $g(x) = x - 1$

**Solution**

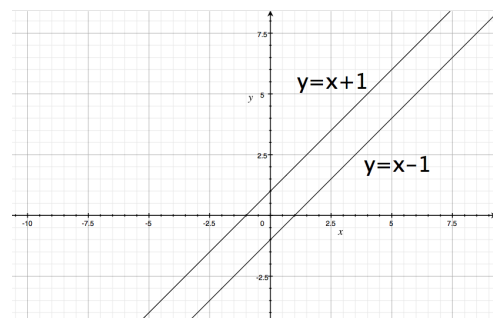(a)

$g$ is $f$ shifted up 6

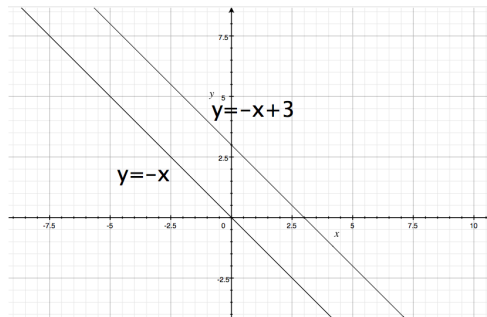(d)

$g$ is $f$ shifted down 1

(b)

$g$ is $f$ shifted down 2

(e)

$g$ is $f$ shifted down 2
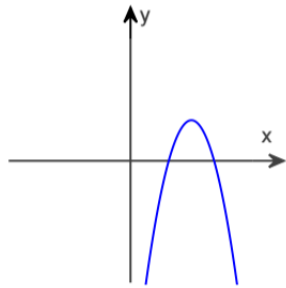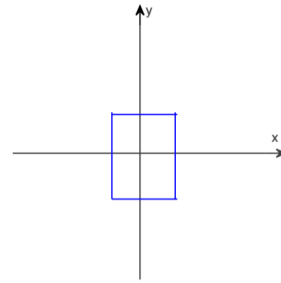
(c)

$g$ is $f$ shifted up 3

5. Use the vertical line test to determine if $y$ is a function of $x$ in the graph.
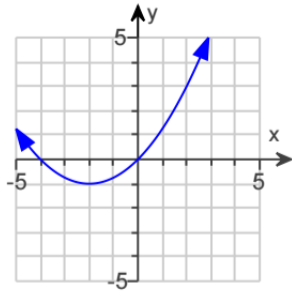
(a)



(b)



**Solution**

(a) The graph passes the vertical line test so it is a  function 

(b) The graph does not pass the vertical line test so it is  not a function

6. Consider the following graph.



(a) Determine the functions domain and range.

(b) Determine the $x$ and $y$ intercepts, if any.

(c) What is $f(2)$ and $f(-2)$?

**Solution**

(a) Domain: $(-\infty, \infty)$, Range: $[-1, \infty)$

(b) $x$-intercept: $-4$ and $0$, $y$-intercept: $0$

(c) $f(2) = 3$ and $f(-2) = -1$

□