Assignment

1. Write the equation of the image of

   a) $y = \frac{1}{x}$ after a reflection in the line $y = x$

   $x \to y, y \to x$ $\qquad x = \frac{1}{y}$ $\qquad y = \frac{1}{x}$

   b) $y = x^3 + x$ after a reflection in the y-axis

   $x \to -x$ $\qquad y = (-x)^3 + (-x)$ $\qquad y = -x^3 - x$

   c) $y = |x|$ after a reflection in the x-axis

   $y \to -y$ $\qquad -y = |x|$ $\qquad y = -|x|$

   d) $y = \sqrt{x-2}$ after a reflection in the line $y = x$

   $x \to y, y \to x$ $\qquad x = \sqrt{y-2}$ $\qquad x^2 + 2 = y, x \geq 0$
   $\qquad\qquad\qquad\qquad x \geq 0, y \geq 2$ $\qquad \to$ only right half of parabola.

   e) $y = x^2 + 1$ after a reflection in the y-axis

   $x \to -x$ $\qquad y = (-x)^2 + 1$ $\qquad y = x^2 + 1$

   f) $y = \cos x$ after a reflection in the x-axis

   $y \to -y$ $\qquad -y = \cos x$ $\qquad y = -\cos x$

2. Describe how the graph of the second function compares to the graph of the first function

   a) $y = 3x + 1$
   $\quad y = -3x - 1$

   $y = -(3x+1)$

   $y \to -y$

   reflection in x-axis

   b) $y = 3x + 1$
   $\quad y = -3x + 1$

   $y = 3(-x) + 1$

   $x \to -x$

   reflection in y-axis.

   c) $y = 3x + 1$
   $\quad x = 3y + 1$

   $x \to y, y \to x$

   reflection in line $y = x$

   d) $y = 10^x$
   $\quad y = 10^{-x}$

   $x \to -x$

   reflection in y-axis.

   e) $y = 10^x$
   $\quad y = -10^x$

   $-y = 10^x$

   $y \to -y$

   reflection in x-axis

   f) $y = 4x^2$
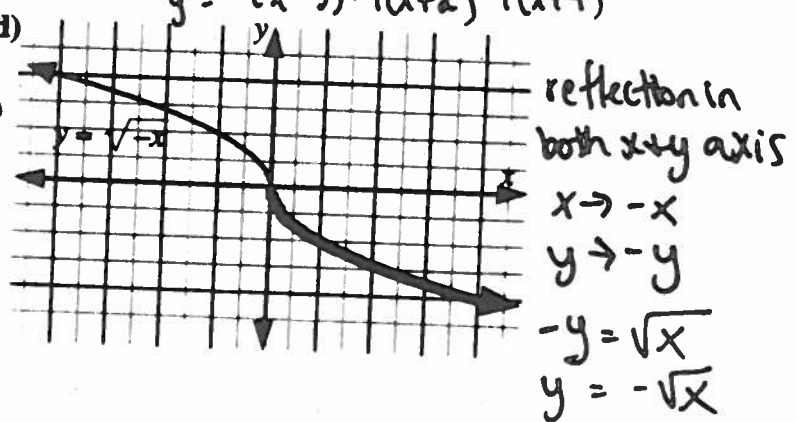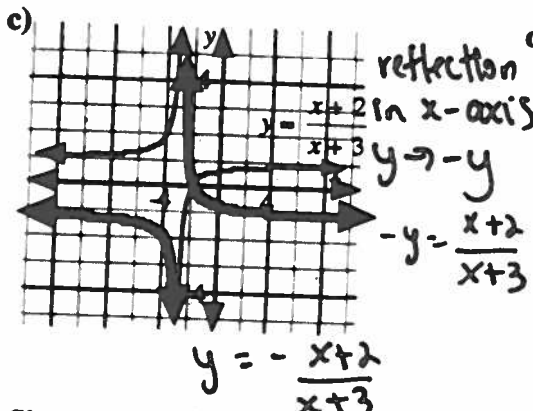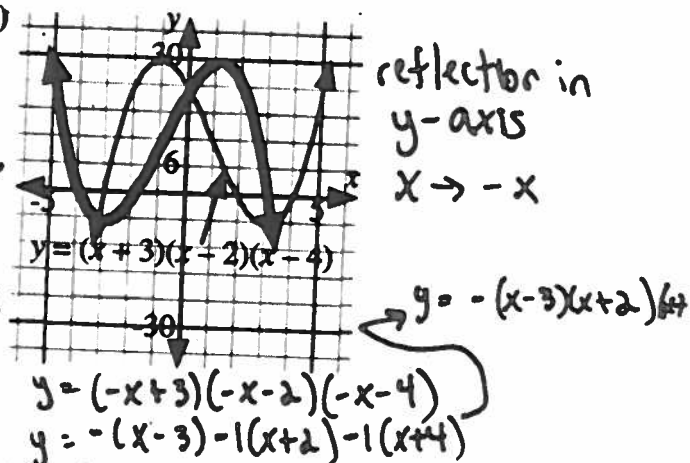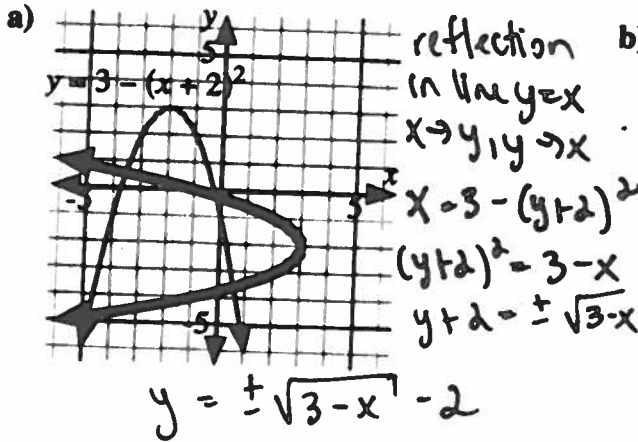 $\quad y = \pm \frac{\sqrt{x}}{2}$

   $y^2 = \frac{x}{4}$ $\qquad x = 4y^2$

   $x \to y, y \to x$

   reflection in line $y = x$.

3. The graph drawn in the thick line is a transformation of the graph drawn in the thin line. Write an equation for each graph drawn in the thick line.
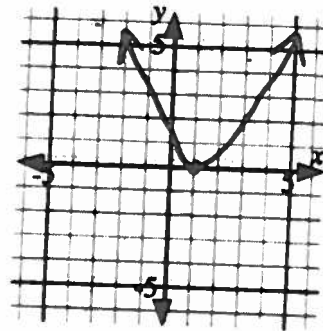
a)

$y = 3 - (x+2)^2$

reflection in line $y=x$

$x \to y, y \to x$

$x = 3 - (y+2)^2$

$(y+2)^2 = 3-x$

$y+2 = \pm\sqrt{3-x}$

$$y = \pm\sqrt{3-x} - 2$$

b)

$y = (x+3)(x-2)(x-4)$

reflector in y-axis

$x \to -x$

$y = -(x-3)(x+2)(x+4)$

$y = (-x+3)(-x-2)(-x-4)$

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

c)

$y = \frac{x+2}{x+3}$

reflection in x-axis

$y \to -y$

$-y = \frac{x+2}{x+3}$

$$y = -\frac{x+2}{x+3}$$

d)

$y = \sqrt{-x}$

reflection in both x+y axis

$x \to -x$

$y \to -y$

$-y = \sqrt{x}$

$$y = -\sqrt{x}$$

4.a) Sketch the graph of $f(x) = (x-1)^2$.
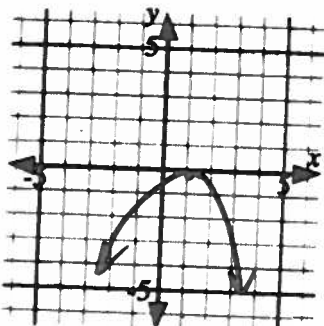
b) Write the equation for:

i) $y = -f(x)$

$y = -(x-1)^2$

iii) $x = f(y)$

$x = (y-1)^2$

$1 \pm \sqrt{x} = y$

ii) $y = f(-x)$
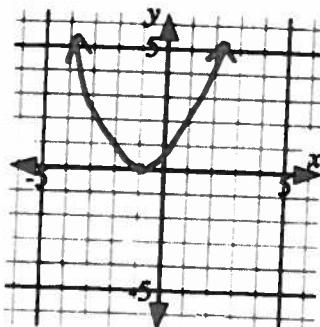
$y = (-x-1)^2$

$y = (x+1)^2$

c) Sketch each graph in b) and state whether the graph represents a function.
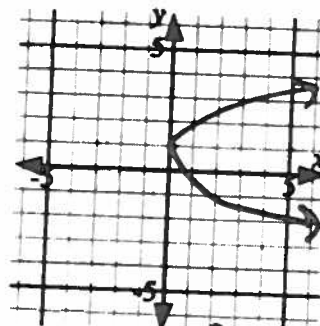
i) $y = -f(x)$

is a function.
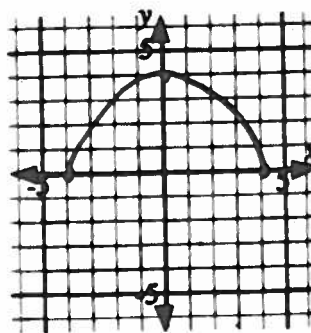
ii) $y = f(-x)$

Is a function

iii) $x = f(y)$

not a function.

5.a) Sketch the graph of the semi-circle $f(x) = \sqrt{16 - x^2}$.

b) Write the equation for:

i) $y = -f(x)$

$$y = -\sqrt{16 - x^2}$$

ii) $y = f(-x)$

$$y = \sqrt{16 - (-x)^2}$$
$$y = \sqrt{16 - x^2}$$

iii) $y = -f(-x)$

$$y = -\sqrt{16 - x^2}$$

iv) $x = f(y)$

$$x = \sqrt{16 - y^2}, \; x \geq 0$$
$$x^2 = 16 - y^2$$
$$y^2 = 16 - x^2 \qquad y = \pm\sqrt{16 - x^2}, \; x \geq 0$$

v) $x = -f(y)$

reflect iv) in y-axis

$x \to -x$

$$y \pm \sqrt{16 - x^2}, \; x \leq 0$$

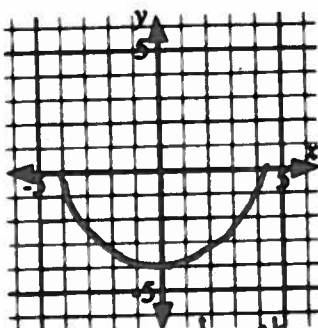or $\quad x = -\sqrt{16 - y^2}$

vi) $x = f(-y)$

reflect iv. in x-axis $\; y \to -y$

$$y = \pm\sqrt{16 - x^2}, \; x \geq 0$$
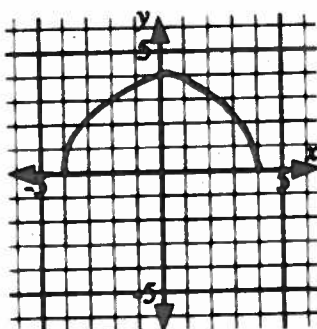$$x = \sqrt{16 - y^2}$$

c) Sketch each graph in b) and state whether the graph represents a function.
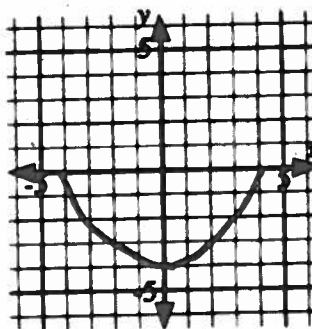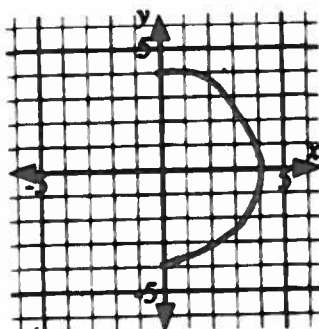
i) $y = -f(x)$

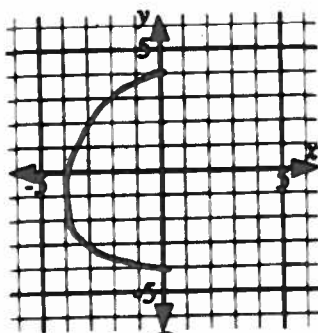is a function

ii) $y = f(-x)$

is

iii) $y = -f(-x)$
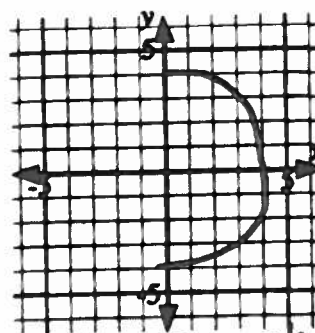

is

iv) $x = f(y)$

No Function

v) $x = -f(y)$

No Function

vi) $x = -f(-y)$

No Function .

d) State the domain and range of each graph in c).

Question	Domain	Range
i) $y = -f(x)$	$x \mid -4 \leq x \leq 4, x \in R$	$y \mid -4 \leq y \leq 0, y \in R$
ii) $y = f(-x)$	$x \mid -4 \leq x \leq 4, x \in R$	$y \mid 0 \leq y \leq 4, y \in R$
iii) $y = -f(-x)$	$x \mid -4 \leq x \leq 4, x \in R$	$y \mid -4 \leq y \leq 0, y \in R$
iv) $x = f(y)$	$x \mid 0 \leq x \leq 4, x \in R$	$y \mid -4 \leq y \leq 4, y \in R$
v) $x = -f(y)$	$x \mid -4 \leq x \leq 0, x \in R$	$y \mid -4 \leq y \leq 4, y \in R$
vi) $x = f(-y)$	$x \mid 0 \leq x \leq 4, x \in R$	$y \mid -4 \leq y \leq 4, y \in R$

Use the following information to answer the next question.

The graph of $y = 2x^5$ is transformed to the graph of $y = -2x^5$.
Three statements are made about the transformed graph.

   i)   It is a reflection of the original graph in the x-axis.
   ii)   It is a reflection of the original graph in the y-axis.
   iii)   It is a reflection of the original graph in the line $y = x$.

Multiple Choice

6. How many of the above statements are **false**?

   A. 0
   B. 1
   C. 2
   D. 3

i) $y \rightarrow -y$ $-y = 2x^5$ $y = -2x^5$ ✓

ii) $x \rightarrow -x$ $y = 2(-x)^5$ $y = -2x^5$ ✓

iii) $x \rightarrow y$
    $y \rightarrow x$ $x = 2y^5$ ✗

7. How could the graph of $y = 2x^3 + 1$ be used to graph $y = -2x^3 + 1$?

   A. Translate the graph of $y = 2x^3 + 1$ vertically.
   B. Reflect the graph of $y = 2x^3 + 1$ in the line $y = x$.
   C. Reflect the graph of $y = 2x^3 + 1$ in the x-axis.
   **D.** Reflect the graph of $y = 2x^3 + 1$ in the y-axis.
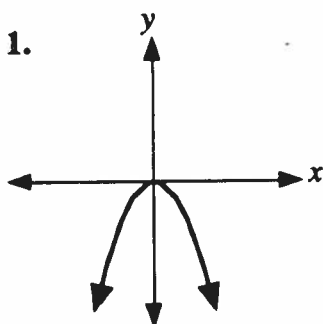
$y = 2x^3 + 1$
$x \rightarrow -x$
$y = 2(-x)^3 + 1$
$y = -2x^3 + 1$

8. Consider the graph of the function $f(x) = x^2$.
Which of the following would result in an identical graph?

A. $-f(x)$ y → -y ✗

(B.) $f(-x)$ x → -x   reflect in y-axis ✓

C. $-f(-x)$ reflect both x + y axis ✗

D. $f(x + 1)$ horizontal traslation 1unit left ✗

Use the following information to answer the next question.

The graphs below represent transformations of the function $f(x) = x^2$. ⟶

1.

2.

3.

4.

5.

6.
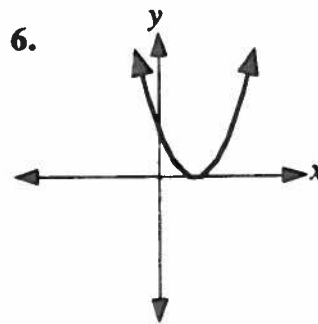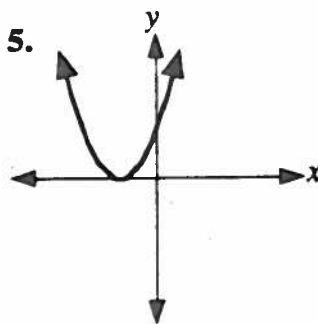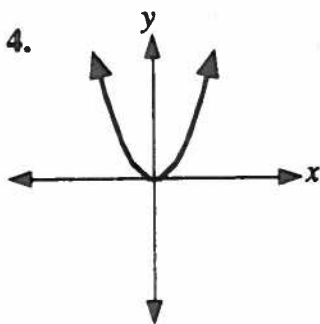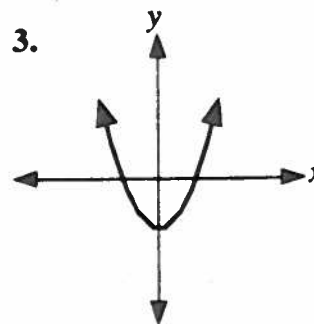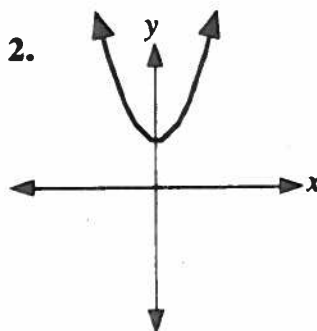
9. Write the graph number corresponding to $f(-x)$ in the first box. reflect in y axis

Write the graph number corresponding to $f(x + 2)$ in the second box. tran. a left

Write the graph number corresponding to $f(x) - 2$ in the third box. trans a down

Write the graph number corresponding to $-f(x)$ in the fourth box. reflect in x-axis

(Record your answer in the numerical response box from left to right.)   4 5 3 1