Transformations of Quadratic Functions – Worksheet

MCR3U

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SOLUTIONS

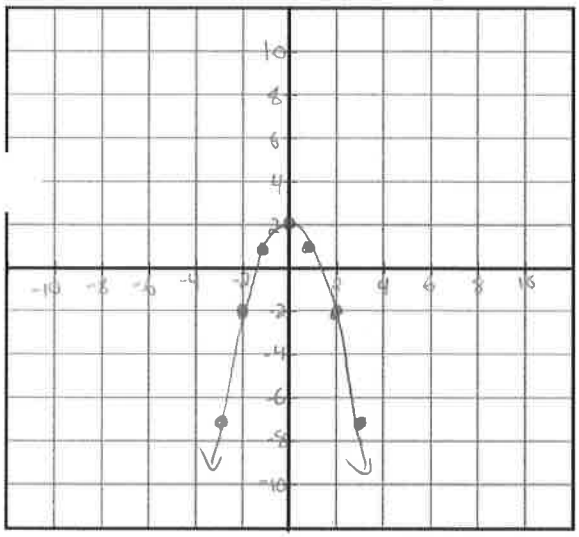
Key points for $y = x^2$

x	y
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9

1) For each of the following graphs:

i) describe the transformations in order (a → k → d → c)
ii) create a table of values for the transformed function
iii) graph the transformed function

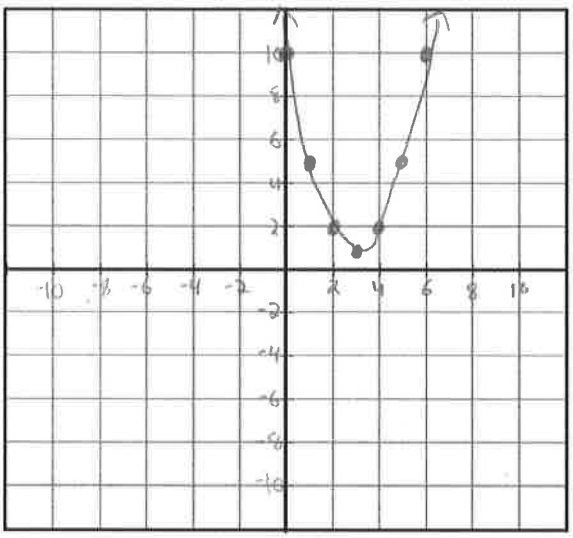
a) $y = -x^2 + 2$



1) vertical reflection (-y)
2) shift up 2 (y+2)

x	-y+2
-3	-7
-2	-2
-1	1
0	2
1	1
2	-2
3	-7

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

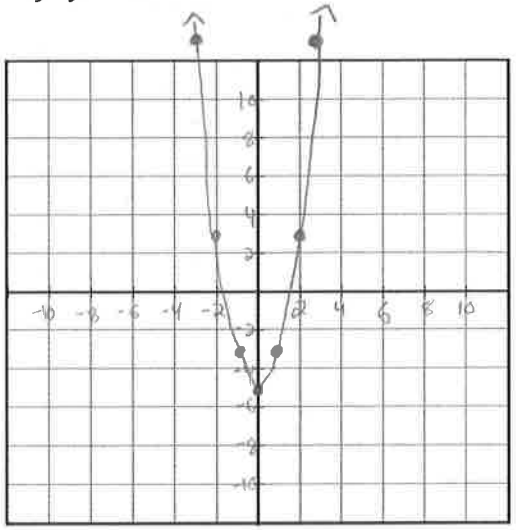


1) shift right 3 units (x+3)
2) shift up 1 unit (y+1)

x+3	y+1
0	10
1	5
2	2
3	1
4	2
5	5
6	10

(-3, 9)
(-2, 4)
(-1, 1)
(0, 0)
(1, 1)
(2, 4)
(3, 9)

c) $y = 2x^2 - 5$

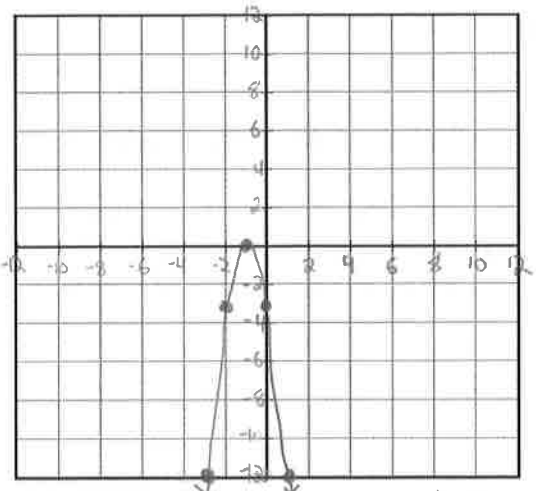


1) vertical stretch bafo 2 $(2y)$

2) shift down 5 units $(y-5)$

x	$2y-5$
-3	13
-2	3
-1	-3
0	-5
1	-3
2	3
3	13

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

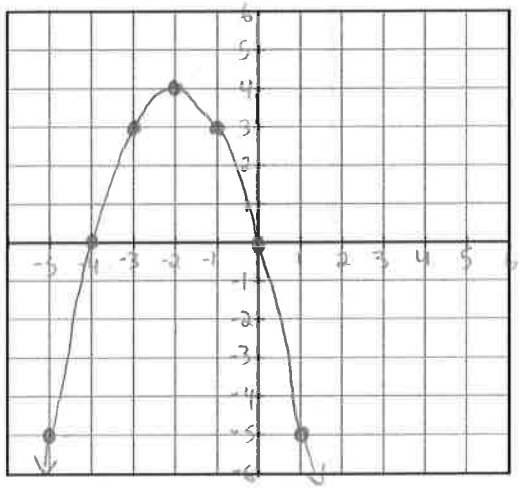


1) vertical stretch by 3 and vertical reflection $(-3y)$

2) phase shift left 1 unit $(x-1)$

$x-1$	$-3y$	
-4	-27	
-3	-12	} just graph these.
-2	-3	
-1	0	
0	-3	
1	-12	
2	-27	

e) $y = -(x+2)^2 + 4$



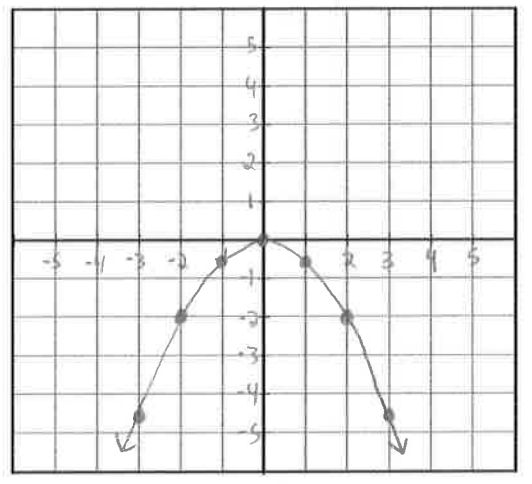
1) Vertical reflection $(-y)$

2) Shift left 2 units $(x-2)$

3) shift up 4 units $(y+4)$

$x-2$	$-y+4$
-5	-5
-4	0
-3	3
-2	4
-1	3
0	0
1	-5

f) $y = -\frac{1}{2}x^2$



1) Vertical stretch bafo $\frac{1}{2}$ and vertical reflection $\left(\frac{y}{-2}\right)$

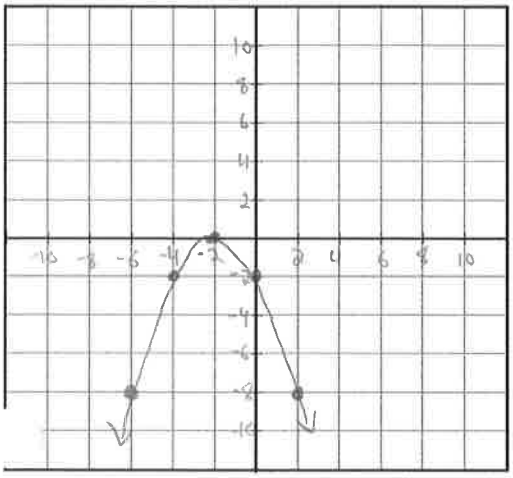
x	$\frac{y}{-2}$
-3	-4.5
-2	-2
-1	-0.5
0	0
1	-0.5
2	-2
3	-4.5

(-3,9)
(-2,4)
(-1,1)
(0,0)
(1,1)
(2,4)
(3,9)

2) For each function $g(x)$:

- **i)** describe the transformations from the parent function $f(x) = x^2$
- **ii)** create a table of values of image points for the transformed function
- **iii)** graph the transformed function and write its equation

a) $g(x) = -2f\left[\frac{1}{2}(x+2)\right]$



1) vertical stretch bafo 2; vertical reflection (-2y)
2) horizontal stretch bafo 2 (2x)
3) shift left 2 units (x-2)

2x-2	-2y
-8	-18
-6	-8
-4	-2
-2	0
0	-2
2	-8
4	-18

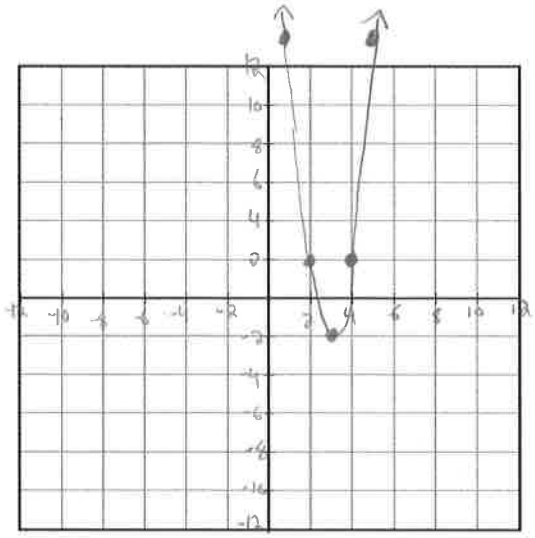
graph these

$g(x) = -2\left[\frac{1}{2}(x+2)\right]^2$

$g(x) = -2\left(\frac{1}{4}\right)(x+2)^2$

$g(x) = -\frac{1}{2}(x+2)^2$

b) $g(x) = 4f(x-3) - 2$

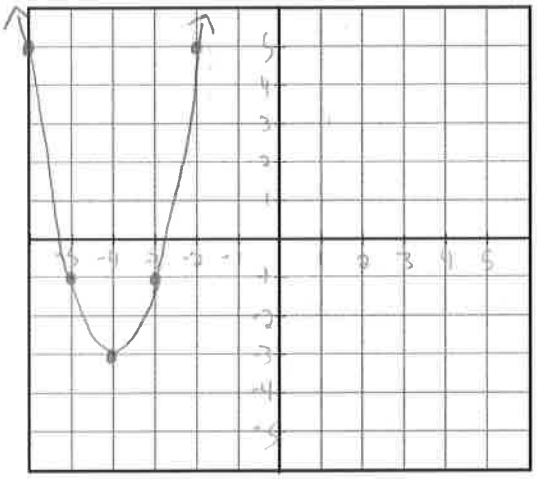


1) vertical stretch bafo 4 (4y)
2) shift right 3 units (x-3)
3) shift down 2 units (y-2)

x+3	4y-2
0	34
1	14
2	2
3	-2
4	2
5	14
6	34

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

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



1) vertical stretch bafo 2 $(2y)$

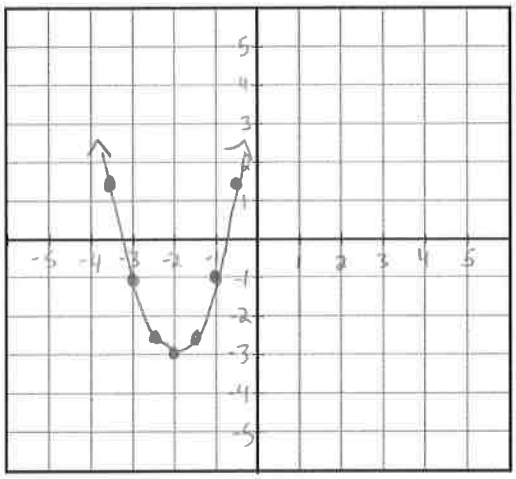
2) shift left 4 units $(x-4)$

3) shift down 3 units $(y-3)$

	$x-4$	$2y-3$	
$(-3,9)$	-7	15	
$(-2,4)$	-6	5	graph these
$(-1,1)$	-5	-1	
$(0,0)$	-4	-3	
$(1,1)$	-3	-1	
$(2,4)$	-2	5	
$(3,9)$	-1	15	

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

d) $y = \frac{1}{2}f[-2(x+2)] - 3$



1) vertical compression bafo $\frac{1}{2}$ $\left(\frac{y}{2}\right)$

2) horizontal compression bafo $\frac{1}{2}$; horizontal reflection $\left(\frac{x}{-2}\right)$

3) left 2 units $(x-2)$

4) down 3 units $(y-3)$

$\frac{x}{-2} - 2$	$\frac{y}{2} - 3$
-0.5	1.5
-1	-1
-1.5	-2.5
-2	-3
-2.5	-2.5
-3	-1
-3.5	1.5

$$g(x) = \frac{1}{2}\left[-2(x+2)\right]^2 - 3$$

$$g(x) = \frac{1}{2}(4)(x+2)^2 - 3$$

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