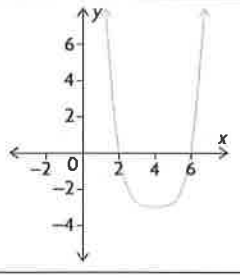
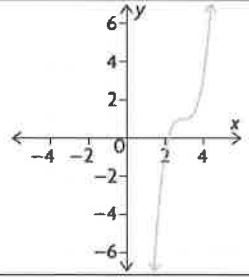
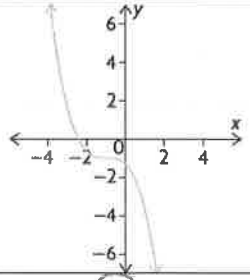
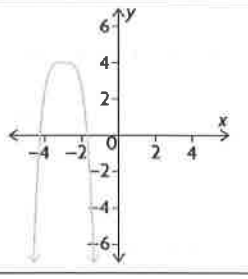
W4 – 1.4 – Transformations
MHF4U

ANSWERS

1) Match each graph with the corresponding function.

A) $y = 2(x-3)^3 + 1$ **B)** $y = -\frac{1}{3}(x+1)^3 - 1$ **C)** $y = 0.2(x-4)^4 - 3$ **D)** $y = -1.5(x+3)^4 + 4$

			
C	A	B	D

2) List a good set of key points for the following parent functions:

$f(x) = x^2$	
x	y
-2	4
-1	1
0	0
1	1
2	4

$f(x) = x^3$	
x	y
-2	-8
-1	-1
0	0
1	1
2	8

$f(x) = x^4$	
x	y
-2	16
-1	1
0	0
1	1
2	16

$f(x) = x^5$	
x	y
-2	-32
-1	-1
0	0
1	1
2	32

3) Identify the a, k, d and c values and explain what transformation is occurring to the parent function:

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

$a = -2$; vertical reflection
vertical stretch bafo 2 $(-2y)$

$d = 1$; shift 1 unit RIGHT $(x+1)$

b) $g(x) = [-\frac{1}{3}(x+5)]^4 - 1$

$k = -\frac{1}{3}$; horizontal reflection
horizontal stretch bafo 3 $(-3x)$

$d = -5$; shift 5 units LEFT $(x-5)$

$c = -1$; shift down 1 unit $(y-1)$

4) Write the full equation given the parent function and the transforming function:

a) $f(x) = x^5$, $g(x) = -3f[2(x+5)] - 1$

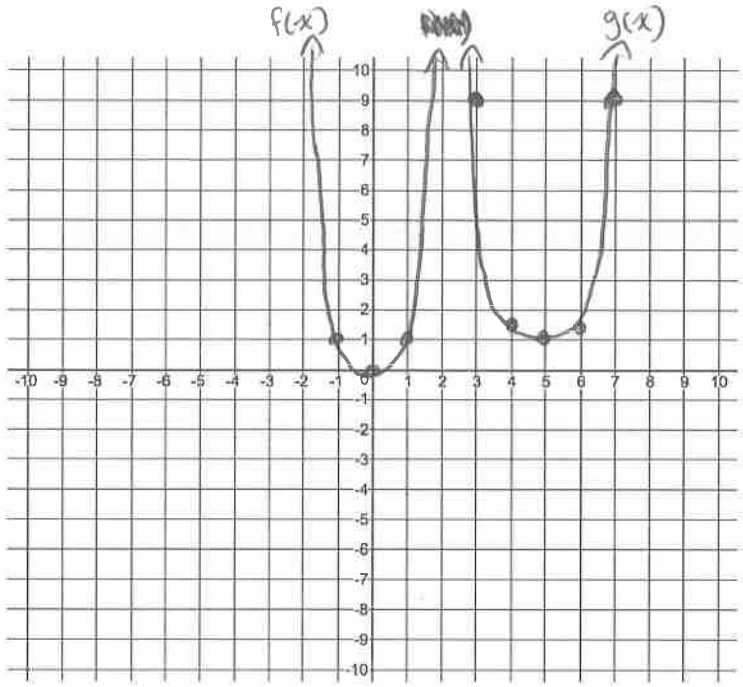
$g(x) = -3[2(x+5)]^5 - 1$

b) $f(x) = x^3$, $g(x) = \frac{1}{2}f\left[-\frac{1}{4}(x-4)\right] + 7$

$g(x) = \frac{1}{2}\left[-\frac{1}{4}(x-4)\right]^3 + 7$

5) For the following questions, use the key points of the parent function to perform transformations. Graph the parent and transformed function. Write the equation of the transformed function.

a) $f(x) = x^4$ $\quad g(x) = \frac{1}{2}f[-(x-5)] + 1$



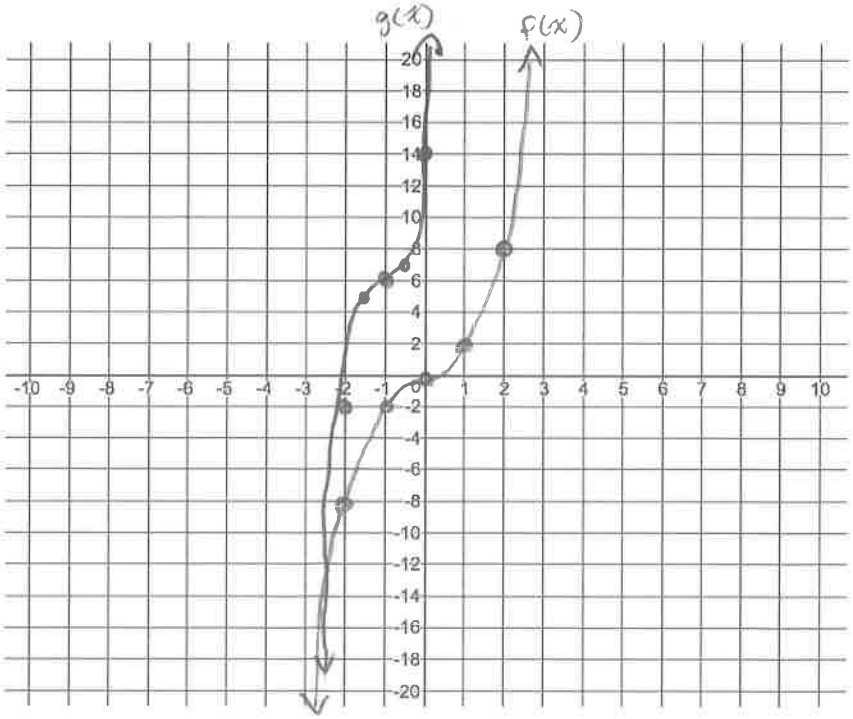
$f(x) = x^4$

x	y
-2	16
-1	1
0	0
1	1
2	16

$g(x) = \frac{1}{2}[-(x-5)]^4 + 1$

$-x+5$	$\frac{y}{2}+1$
7	9
6	1.5
5	1
4	1.5
3	9

b) $f(x) = x^3$ $\quad g(x) = -f[-2(x+1)] + 6$



$f(x) = x^3$

x	y
-2	-8
-1	-1
0	0
1	1
2	8

$g(x) = -[-2(x+1)]^3 + 6$

$\frac{x}{-2}-1$	$-y+6$
0	14
-0.5	7
-1	6
-1.5	5
-2	-2

6) Write an equation for the function that results from the given transformations.

a) The function $f(x) = x^4$ is translated 2 units to the left and 3 units up. $d = -2$ $c = 3$

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

b) The function $f(x) = x^5$ is stretched horizontally by a factor of 5 and translated 12 units to the left. $k = \frac{1}{5}$ $d = -12$

$$g(x) = \left[\frac{1}{5}(x+12)\right]^5$$

c) The function $f(x) = x^4$ is stretched vertically by a factor of 3, reflected vertically in the x-axis, and translated 6 units down and 1 unit to the left. $a = -3$ $c = -6$ $d = -1$

$$g(x) = -3(x+1)^4 - 6$$

d) The function $f(x) = x^6$ is reflected vertically in the x-axis, stretched horizontally by a factor of 5, reflected horizontally in the y-axis, and translated 3 units down and 1 unit to the right. $a = -1$ $k = \frac{-1}{5}$ $c = -3$, $d = 1$

$$g(x) = -\left[-\frac{1}{5}(x-1)\right]^6 - 3$$

ANSWER KEY

1) C A B D

2)

$f(x) = x^2$	
x	y
-2	4
-1	1
0	0
1	1
2	4

$f(x) = x^3$	
x	y
-2	-8
-1	-1
0	0
1	1
2	8

$f(x) = x^4$	
x	y
-2	16
-1	1
0	0
1	1
2	16

$f(x) = x^5$	
x	y
-2	-32
-1	-1
0	0
1	1
2	32

3) a) $a = -2$; vertical reflection and vertical stretch by a factor of 2 $(-2y)$
$d = 1$; shift right 1 unit $(x + 1)$

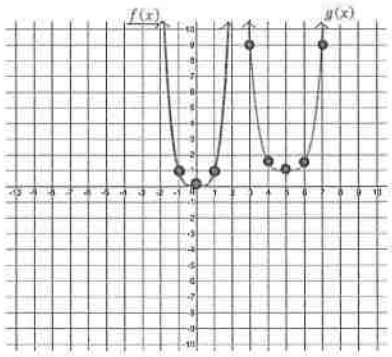
b) $k = -\frac{1}{3}$; horizontal reflection and horizontal stretch by a factor of 3 $(-3x)$
$d = -5$; shift left 5 units $(x - 5)$
$c = -1$; shift down 1 unit $(y - 1)$

4) a) $g(x) = -3[2(x+5)]^5 - 1$ **b)** $g(x) = \frac{1}{2}[-\frac{1}{4}(x-4)]^3 + 7$

5) a)

$f(x) = x^4$	
x	y
-2	16
-1	1
0	0
1	1
2	16

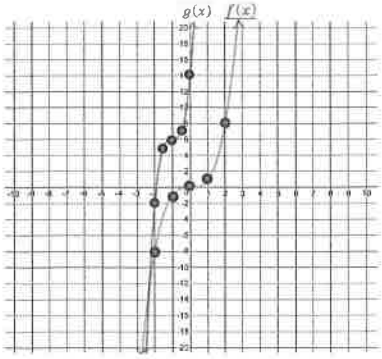
$g(x) = \frac{1}{3}[-(x-5)]^4 + 1$	
$-x+5$	$\frac{y}{3}+1$
7	9
6	1.5
5	1
4	1.5
3	9



b)

$f(x) = x^3$	
x	y
-2	-8
-1	-1
0	0
1	1
2	8

$g(x) = -[-2(x+1)]^3 + 6$	
$\frac{x}{-2} - 1$	$-y + 6$
0	14
-0.5	7
-1	6
-1.5	5
-2	-2



6) a) $g(x) = (x+2)^4 + 3$ **b)** $g(x) = \left[\frac{1}{5}(x+12)\right]^5$ **c)** $g(x) = -3(x+1)^4 - 6$ **d)** $g(x) = -\left[-\frac{1}{5}(x-1)\right]^6 - 3$