

1.4 Transformations Worksheet with solutions

This document was composed and formatted by Annie Bernatchez.

The course material originated from www.jensenmath.ca

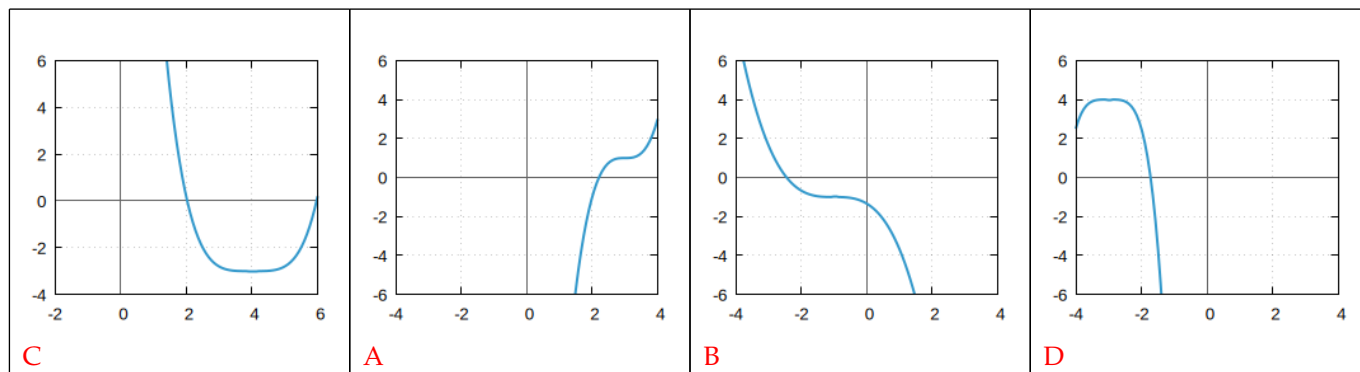
1) Match each graph with the corresponding function.

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) $y = -1.5(x + 3)^4 + 4$



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

$f(x) = x^2$	$f(x) = x^3$	$f(x) = x^4$	$f(x) = x^5$																																																
<table><tr><th>x</th><th>y</th></tr><tr><td>-2</td><td>4</td></tr><tr><td>-1</td><td>1</td></tr><tr><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td></tr><tr><td>2</td><td>4</td></tr></table>	x	y	-2	4	-1	1	0	0	1	1	2	4	<table><tr><th>x</th><th>y</th></tr><tr><td>-2</td><td>-8</td></tr><tr><td>-1</td><td>-1</td></tr><tr><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td></tr><tr><td>2</td><td>8</td></tr></table>	x	y	-2	-8	-1	-1	0	0	1	1	2	8	<table><tr><th>x</th><th>y</th></tr><tr><td>-2</td><td>16</td></tr><tr><td>-1</td><td>1</td></tr><tr><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td></tr><tr><td>2</td><td>16</td></tr></table>	x	y	-2	16	-1	1	0	0	1	1	2	16	<table><tr><th>x</th><th>y</th></tr><tr><td>-2</td><td>-32</td></tr><tr><td>-1</td><td>-1</td></tr><tr><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td></tr><tr><td>2</td><td>32</td></tr></table>	x	y	-2	-32	-1	-1	0	0	1	1	2	32
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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 and vertical stretch by a factor of 2 ($-2y$)
- $d = 1$; shift right 1 unit ($x + 1$)

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

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

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

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.

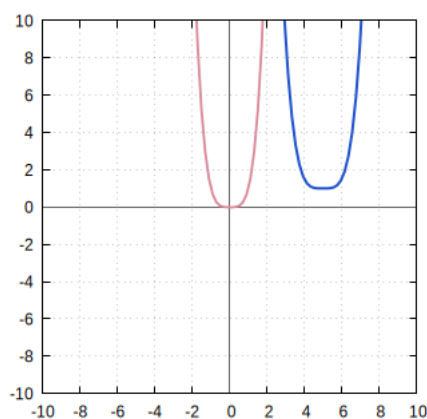
a) $f(x) = x^4$ $g(x) = \frac{1}{2}f[-(x-5)] + 1$

$f(x) = x^4$

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

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

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



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

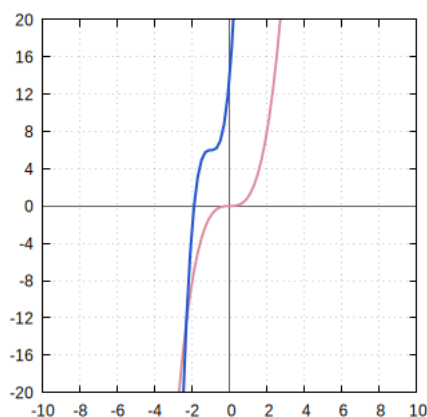
b) $f(x) = x^3$ $g(x) = -f[-2(x+1)] + 6$

$f(x) = x^3$

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

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

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



$$g(x) = 8(x+1)^3 + 6$$

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.

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

b) The function $f(x) = x^5$ is stretched horizontally by a factor of 5 and translated 12 units to the left.

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

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.

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

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.

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