1.4 Transformations

recall: polynomial functions of the form can be transformed according to the roles of the parameters *a, k, d,* and *c* in the equation: $y = a[k(x-d)]^n + c$

Example 1)

The graph of $y = x^3$ is transformed to obtain the graph of

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

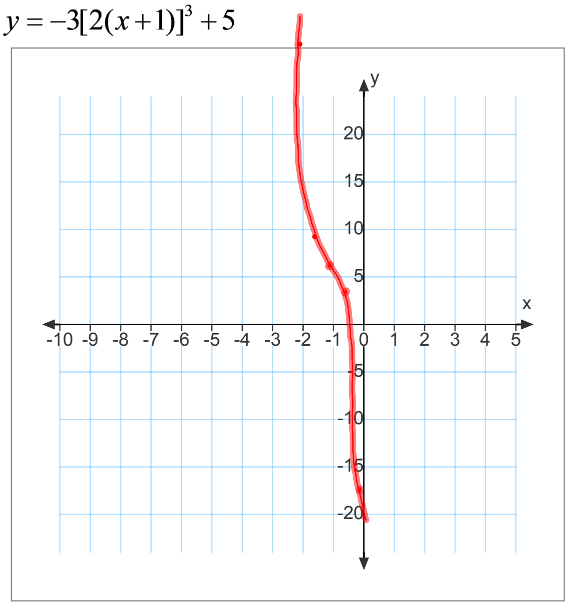
(a) State the parameters and describe the corresponding transformations.

Vertical stretch by a factor of 3
Horizontal compression by a factor of 1/2
Vertical translation 5 units up
Horizonta translation 1 unit to the left
Reflection in X-axis

(b) Complete the table:

$y = x^3$	$y = (2x)^3$	$y = -3(2x)^3$	$y = -3[2(x+1)]^3 + 5$
(-2, -8)	(-1, -8)	(-1, 24)	(-2, 29)
(-1, -1)	(-1/2, -1)	(-1/2, 3)	(-1.5, 8)
(0, 0)	(0, 0)	(0, 0)	(-1, 5)
(1, 1)	(1/2, 1)	(1/2, -3)	(-1/2, 2)
(2, 8)	(1, 8)	(1, -24)	(0, -19)

(c) Sketch a graph of $y = -3[2(x+1)]^3 + 5$



(d) State the domain and range

D: $\{x \mid x \in \mathbb{R}\}$
R: $\{y \mid y \in \mathbb{R}\}$

Example 2)

Describe the transformations that must be applied to the graph of f(x), to obtain the transformed function. Write the corresponding equation, state the domain and range.

$f(x) = x^5$ $\qquad y = \frac{1}{4} f[-2x+6]+4$ $\rightarrow y = \frac{1}{2} f[-2(x-3)]+4$

Vertical compression by a factor of 1/4

Horizontal compression by a factor of 1/2

Vertical translation 4 units up

Horizontal translation 3 units right

Reflection in y-axis

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