

1.4 Transformations

BLM 1-14

(page 1)

1. a) The graph of $y = x^3$ is transformed to obtain the graph of $y = -2(3x)^3 + 5$. State the parameters and describe the corresponding transformations.

b) Complete the table.

$y = x^3$	$y = (3x)^3$	$y = -2(3x)^3$	$y = -2(3x)^3 + 5$
(-2, -8)			
(-1, 1)			
(0, 0)			
(1, 1)			
(2, 8)			

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

2. Compare each polynomial function with the equation $y = a[k(x - d)]^n + c$. State the values of the parameters a , k , d and c and the degree n , assuming that the base function is a power function. Describe the transformation that corresponds to each parameter.

a) $y = \frac{1}{2}(x + 3)^2 - 5$

b) $y = [2(x - 2)]^3 + 0.5$

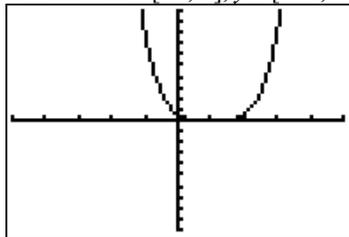
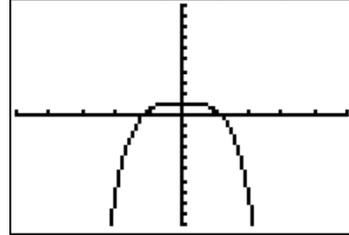
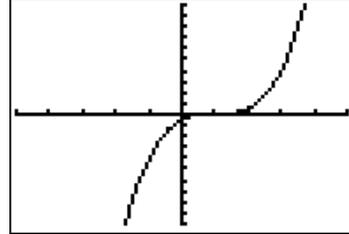
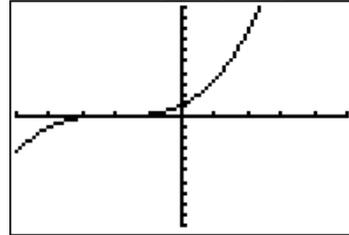
c) $y = -(3x - 6)^4 - 2$

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

3. Match each graph with the corresponding function. Justify your choice.

i) $y = -\frac{1}{2}x^4 + 1$ ii) $y = \left(\frac{1}{2}x + 1\right)^3$

iii) $y = \frac{1}{2}(x - 1)^3$ iv) $y = \frac{1}{2}(x - 1)^4$

a) Window: $x \in [-5, 5], y \in [-10, 10]$ b) Window: $x \in [-5, 5], y \in [-10, 10]$ c) Window: $x \in [-5, 5], y \in [-10, 10]$ d) Window: $x \in [-5, 5], y \in [-10, 10]$ 

4. Describe the transformation that must be applied to the graph of each power function $f(x)$ to obtain the transformed function. Write the transformed function.

a) $f(x) = x^3, y = 2f(x - 3) - 4$

b) $f(x) = x^4, y = -f(2x + 6) + 1$

5. a) Given a base function of $y = x^4$, list the parameters of the polynomial function

$$y = \frac{1}{2}[3(x - 1)]^4 + 2.$$

- b) Describe how each parameter in part a) transforms the graph of $y = x^4$.
c) Determine the domain, range, vertex and equation of the axis of symmetry for the transformed function.

6. i) Describe the transformation that must be applied to the graph of each power function, $f(x)$, to obtain the transformed function.

a) $f(x) = x^2, y = -3f(x-2) - 4$

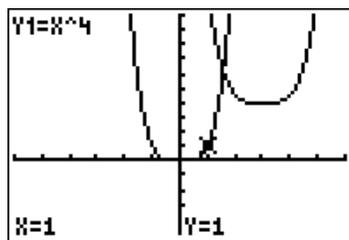
b) $f(x) = x^4, y = 2f(2x+6)$

c) $f(x) = x^3, y = -\frac{1}{2}f\left(\frac{1}{2}(x-1)\right) - 5$

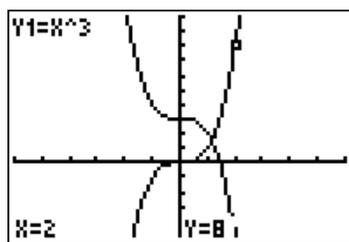
- ii) Write the full equation of each transformed function in part i).
 iii) Sketch each base function from part i) and its transformed function from part ii) on the same set of axes.
 iv) State the domain and range of each pair of functions in part iii).

7. Transformations are applied to each power function to obtain the resulting graph. Determine an equation for the transformed function. All graphs have window variables $x \in [-6, 6], y \in [-5, 10]$.

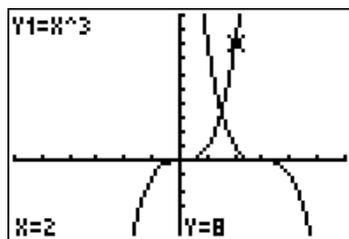
a)



b)



c)



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

- ii) State the domain and range for each function. For even functions, give the vertex and the equation of the axis of symmetry.

- a) The function $f(x) = x^5$ is compressed vertically by a factor of $\frac{1}{2}$ and

translated 3 units down.

- b) The function $f(x) = x^3$ is stretched vertically by a factor of 2, reflected in the x -axis and translated 4 units to the right and 1 unit up.

- c) The function $f(x) = x^4$ is reflected in the x -axis, stretched horizontally by a factor of 3 and translated 5 units to the left.

- d) The function $f(x) = x^4$ is stretched vertically by a factor of 3, stretched horizontally by a factor of 2, reflected in the y -axis and translated 1 unit to the right and 6 units down.

9. a) Predict the relationship between the graph of $y = x^4 + x^3$ and the graph of $y = [(x+3)^4 + (x+3)^3] - 1$.

- b) **Use Technology** Graph each function in part a) to verify the accuracy of your prediction.

- c) Determine the x -intercepts of each function in part a). Round your answers to 1 decimal place.

- d) Give the approximate domain and range of each function in part a). Round your answers to one decimal place.