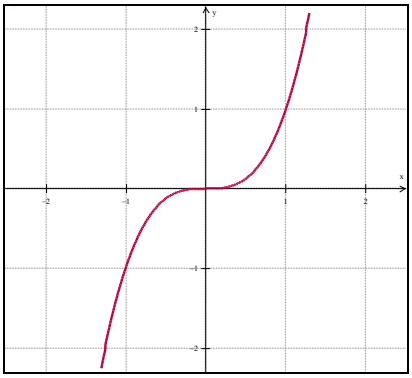
3.4 Transformations of Power Functions (Cubic, Quartic, and other)

A Cubic Function

The *cubic* function has the parent function $f(x) = x^3$ and after transformations may be written as:

$$f(x) = a[b(x-c)]^3 + d$$



Ex 1. Use transformations to graph each function.

a) $f(x) = -2x^3$

b) $f(x) = (x-1)^3 - 2$

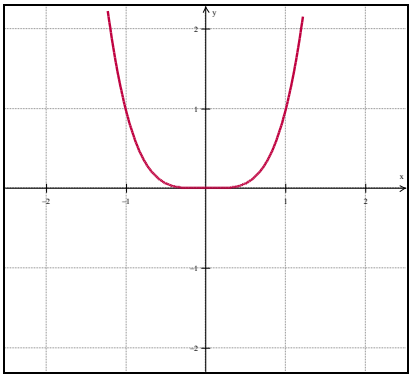
c) $f(x) = -(x+2)^3 + 3$

d) $f(x) = -(3-x)^3 - 2$

B Quartic Function

The *quartic* function has the parent function $f(x) = x^4$ and after transformations may be written as:

$$f(x) = a[b(x-c)]^4 + d$$



Ex 2. Use transformations to graph each function.

a) $f(x) = -(x-2)^4$

b) $f(x) = (x+1)^4 - 3$

c) $f(x) = 2(x-1)^4 - 1$

d) $f(x) = 2 - (3-x)^4$

Ex 3. Find the real zeros (x-intercepts) and the y-intercept.

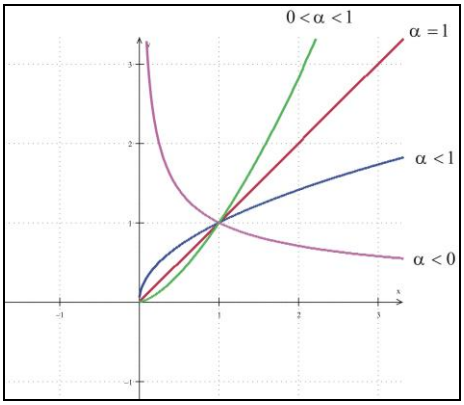
a) $f(x) = 8 + (x+2)^3$

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

C Power Function (Real Exponent)

The power function with a real exponent is defined by:

$$f(x) = x^{\alpha} \quad ; \quad \alpha \in R$$



D Power Function (Rational Exponent)

The power function with a rational exponent is defined by:

$$f(x) = x^{m/n} \quad ; \quad n \neq 0$$

where m and n are integers.

Ex 4. Use symmetry and exponent rules to sketch the graph of the following functions.

a) $y = x^{1/3}$

b) $y = x^{2/3}$

c) $y = x^{3/2}$

d) $y = x^{4/3}$

e) $y = x^{-1/3}$

f) $y = x^{-2/3}$

Ex 5. Use transformations to sketch the graph of the following functions.

a) $y = -(x+2)^{1/3}$

b) $y = 2-(x-1)^{3/4}$

c) $y = (x+4)^{-3/2}$

Ex 6. Sketch the graph of the following functions.

a) $f(x) = x^2\sqrt[3]{x-1}$

b) $f(x) = x^{1/3}(x-8)^{2/3}$

Reading: Nelson Textbook, Pages 149-155
Homework: Nelson Textbook, Page 155: #1, 3ab, 6ab, 9, 10, 14