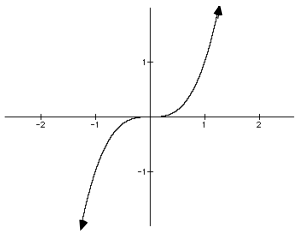
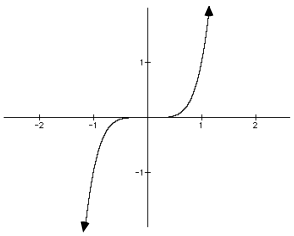
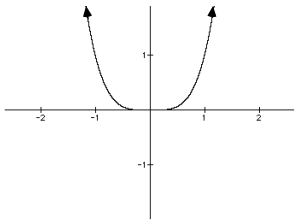
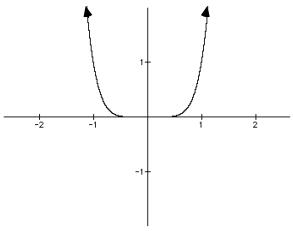
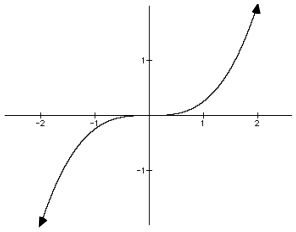
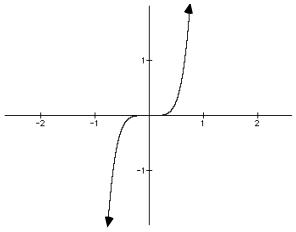
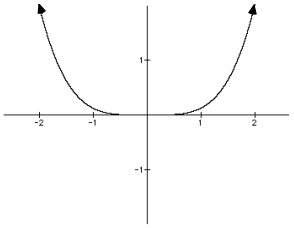
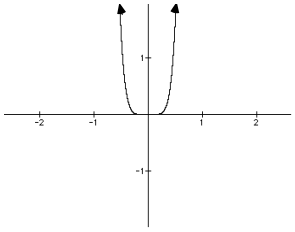
§3.2 Polynomial Functions of Higher Degree

Polynomials are **<u>continuous</u>** (no breaks in the graph) and **<u>smooth</u>** (no sharp angles, only rounded curves)

Graphing Functions of the Form: $P(x) = ax^n$

Examples:

$P(x) = x^3$	$P(x) = x^5$	$P(x) = x^4$	$P(x) = x^6$
			
			
$P(x) = \frac{1}{3}x^3$	$P(x) = 8x^5$	$P(x) = \frac{1}{8}x^4$	$P(x) = 9x^6$

<u>Note</u>:The graph of $y = x^n$ is similar to the graph of $\begin{cases} y = x^2 & \text{if } n \text{ is even} \\ y = x^3 & \text{if } n \text{ is odd} \end{cases}$,

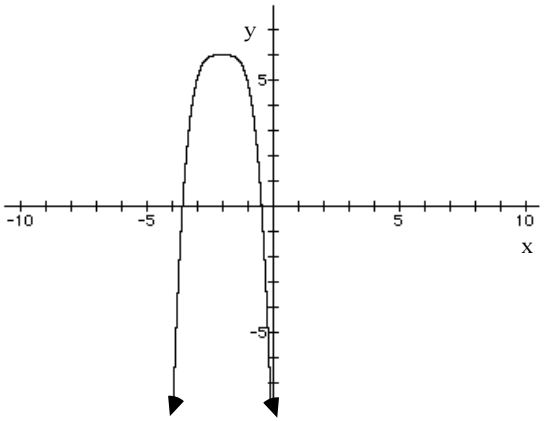
except that the greater n is, the flatter the graph is on [-1, 1] and the steeper it is on (-oo, -1) U (1, oo)

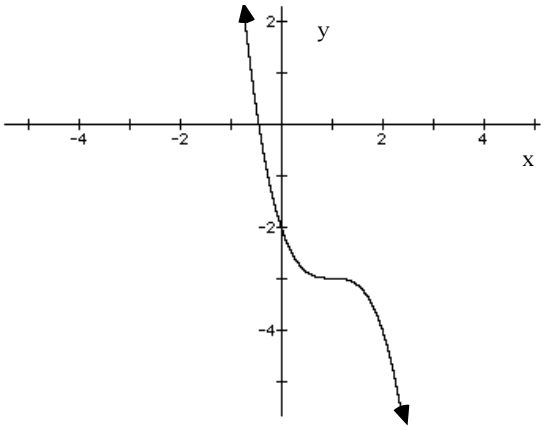
Examining Vertical and Horizontal Translations (Shifts):

Example 1: Graph

a.) $y = -(x + 2)^4 + 6$

b.) $y = -3 - (x - 1)^3$





Graphing Polynomial Functions:

To Sketch the Graph of a Polynomial Function $y = P(x)$

(1) Factor the polynomial completely.

(2) Find the x - intercept(s) by solving $P(x) = 0$ and y - intercept(s) by evaluating $P(0)$.

(3) Put the x - intercept(s) on a number line and test the intervals to determine where P is positive (above the x - axis) and negative (below the x - axis).

(4) Plot the intercepts and at least one other point in the middle intervals and use the other information to graph.

(Note: the points should join forming a smooth, unbroken curve.)

Example 2: Graph each polynomial function.

a.) $P(x) = (2x + 3)(x - 1)(x + 2)$

b.) $P(x) = 3x^4 + x^3 - 2x^2$