

**Objective:** to explore changes in graphs and recognize odd and even functions.

**Warm-up:** Classify each polynomial by degree and by number of terms. Make sure that all polynomials are in standard form first.

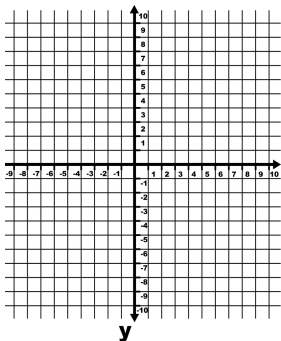
a.  $a^2 + a^3 - 4a^4$

b.  $(2a - 5)(a^2 - 1)$

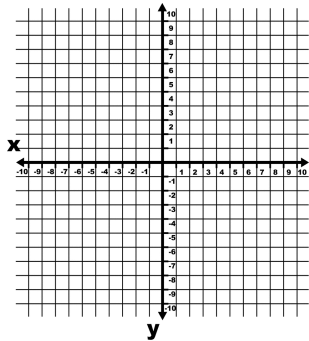
**Explore:** Graph each of the following equations.

**Graphing Absolute Value Functions:** Using your graphing calculator, graph each of the following equations – you can get the absolute value on your calculator by pressing the MATH key, then arrow over to NUM and your first choice should be abs( then just press ENTER. **Be sure to close your parenthesis when the absolute value ends.**

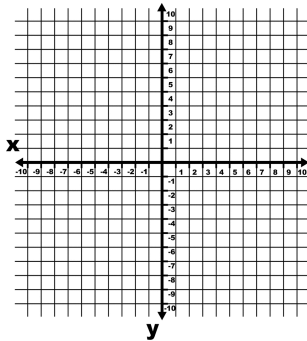
1 a.  $y = |x|$



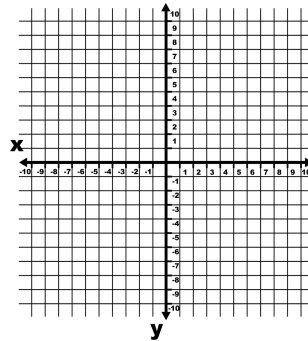
b.  $y = |x| + 3$



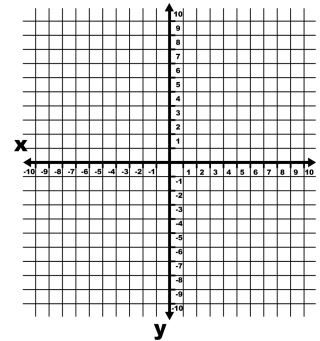
c.  $y = |x + 3|$



d.  $y = 3|x|$



e.  $y = -\frac{1}{3}|x|$



Explain what happened to the graph in part b. \_\_\_\_\_

Explain what happened to the graph in part c. \_\_\_\_\_

Explain what happened to the graph in part d. \_\_\_\_\_

Explain what happened to the graph in part e. \_\_\_\_\_

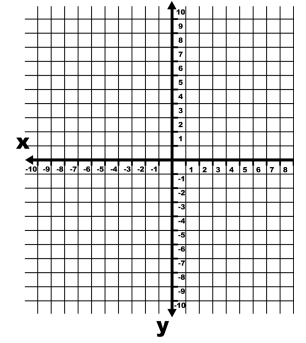
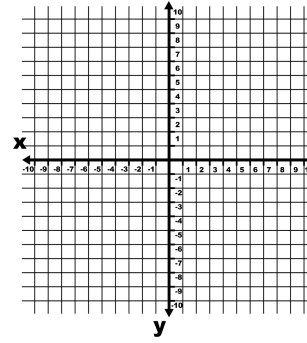
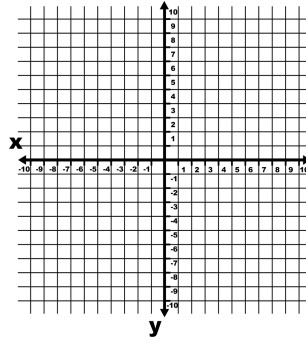
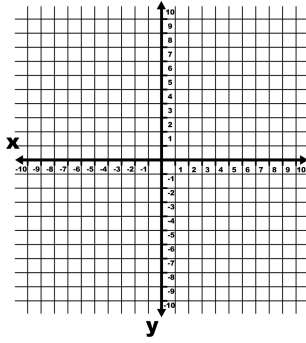
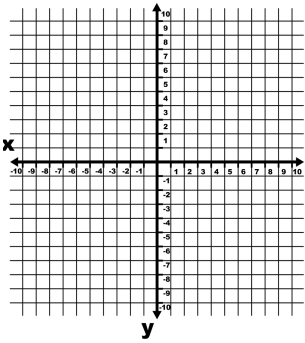
2 a.  $y = x^2$

b.  $y = x^2 - 3$

c.  $y = (x - 3)^2$

d.  $y = -3x^2$

e.  $y = \frac{1}{3}x^2$



Explain what happened to the graph in part b. \_\_\_\_\_

Explain what happened to the graph in part c. \_\_\_\_\_

Explain what happened to the graph in part d. \_\_\_\_\_

Explain what happened to the graph in part e. \_\_\_\_\_

### Reflect:

3. Consider the two equations:  $y = x^3$  and  $y = x^3 - 6$ . How are these two graphs different?

4. Consider the two equations:  $y = x^3$  and  $y = (x + 2)^3 - 4$ . How are these two graphs different?

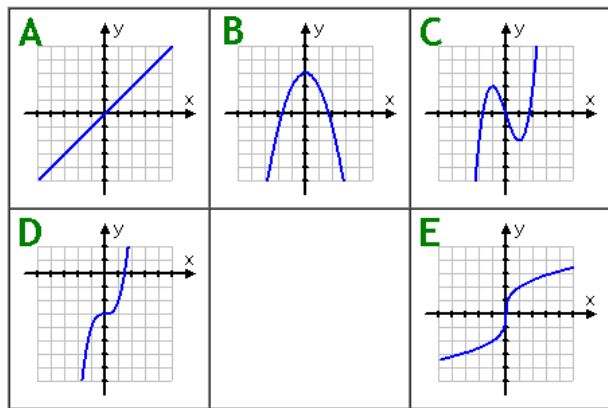
5. Consider the two equations:  $y = x^3$  and  $y = 3(x + 1)^3 - 5$ . How are these two graphs different?

### Odd and Even Functions:

**An Even Function:** The graph of an even function is symmetric about the y-axis.

**An Odd Function:** The graph of an odd function is symmetric about the origin.

7. Determine which graphs are odd, even, or neither.



8. Determine whether each function is even, odd, or neither.

a.  $g(x) = \frac{1}{x^3+x}$

b.  $f(x) = x^4 + x^3 + x^2 + x + 1$