INVESTIGATE Factored Form of Polynomials. $y = a(\ )(\ )^3 \ldots$

As you may have noticed from above, polynomial graphs behave near the x-axis in several different ways: The graph can "bounce off", "cut through", or "bend" near the roots (zeros).

11. For each graph and equation given find the relationship between the power of the factor in the equation and whether the graph would "bounce", "cut" or "bend" through zeros.

1. $y = (x+1)^2(x-2)^4$

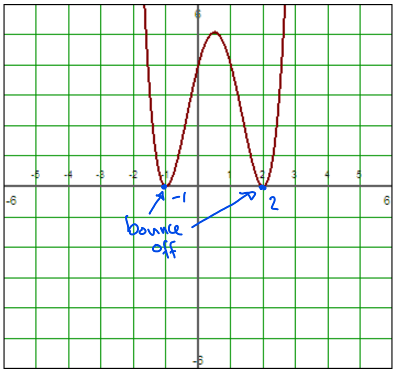
degree: 6

Sub y = 0

$(x+1)^2(x-2)^4 = 0$

$x+1=0$ or $x-2=0$

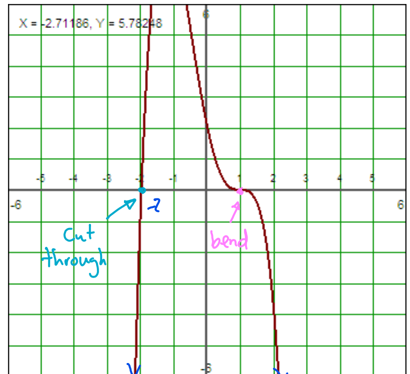
$x=-1$ $x=2$



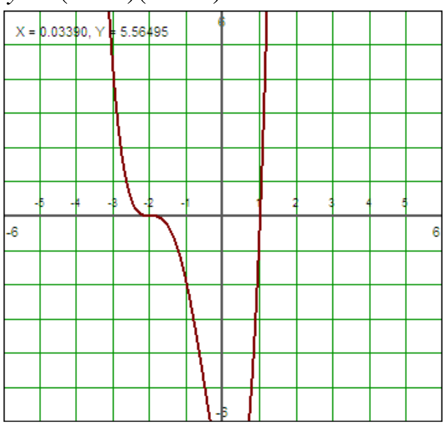
2. $y = -(x-1)^3(x+2)^1$

$x=1$ $x=-2$

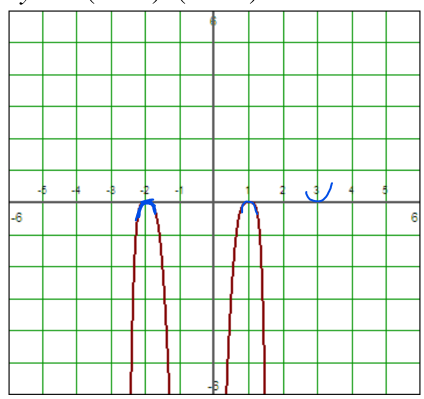
degree = 4



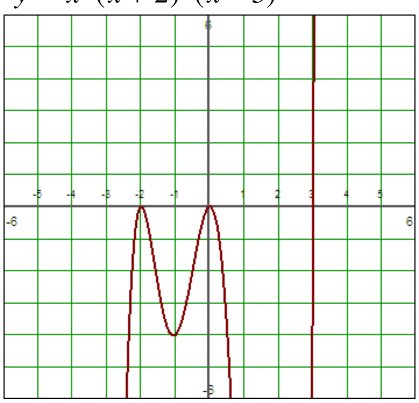
3. $y = (x-1)(x+2)^3$



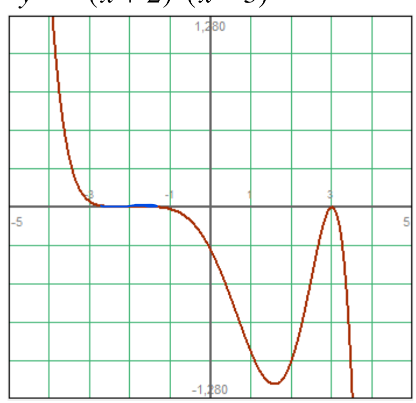
4. $y = -(x-1)^4(x+2)^4$



5. $y = x^2(x+2)^2(x-3)$



6. $y = -(x+2)^5(x-3)^2$



12. Summarize:

When a polynomial function has a repeated **even** root, the graph of the function ___Bounce off___ at that root → look like quadratic near the zero

When a polynomial function has a repeated **odd** root greater than 1, the graph of the function ___Bend___ at that root. → look like cubic near the zero

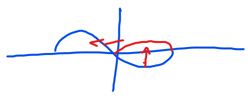
When a polynomial function has a root of order 1, the graph of the function ___Cut through___ at that root. → look like Linear near the zero

INVESTIGATE Symmetry of Polynomials.

13. You just finished looking at Odd and Even Degree Polynomials. Please don't confuse the words Odd Function with Odd Degree Function. These are totally different concepts. Recall what you learned about symmetry: summarize here how something can have odd symmetry, or even symmetry or neither symmetry – graphically and algebraically.

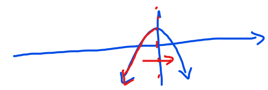
Odd function: $f(-x) = -f(x)$

2 Reflections in both x-axis + y-axis



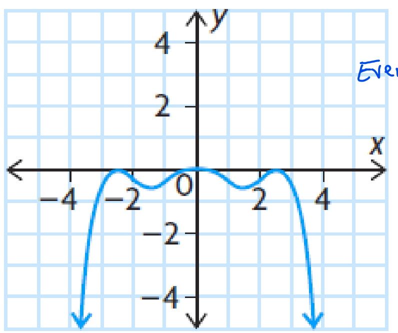
Even function: $f(-x) = f(x)$

Reflection in y-axis



14. For each graph or equation given determine the degree & symmetry.

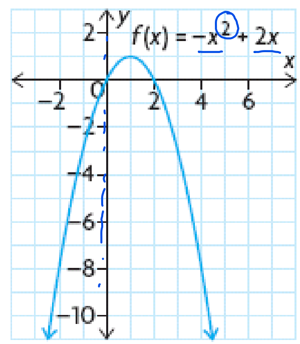
a. $f(x) = -0.01(x-0.5)^1(x+0.5)^1(x-2.5)^2(x+2.5)^2$



degree = 6

Even Symmetry

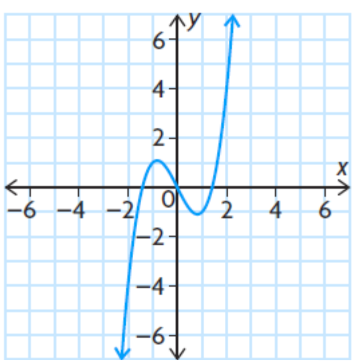
b. (x^2) (x^1)



degree = 2

Neither

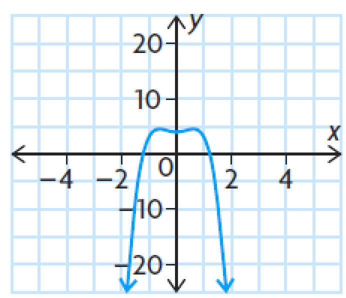
c. $f(x) = x(x-\sqrt{2})(x+\sqrt{2})$



degree = 3

odd Symmetry

d. $y = -4x^4 + 3x^2 + 4$



degree = 4

Even symmetry

e. $f(x) = x^4 - 2x^2 + 1x^0$

degree = 4

Even symmetry

sub $-x$

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

$= x^4 - 2x^2 + 1$

$f(-x) = f(x)$

$\therefore$ even

f. $f(x) = x^2 - 3x^1 + 4x^0$

degree = 2

Neither

find $f(-x)$

$-f(x)$

compare to $-f(x) = f(-x)$? Odd

$f(-x) = f(x)$ Even

g. $f(x) = x^5 - 3x^7 + 9x^0$

degree: 7

Neither

h. $f(x) = x^5 - 3x$

degree: 5

odd

15. Summarize:

Odd degree polynomial can have ___odd___ or ___neither___ symmetry. It will be symmetric only if expanded form has ___all odd powers on each x___

Even degree polynomial can have ___Even___ or ___neither___ symmetry. It will be symmetric only if expanded form has ___all even powers on each x___

* Constant term have x^0 on them

ex: $f(x) = x^5 - x^7 + 5$ → constant term

$5x^0$