

## Graphing a Polynomial Function

- ① Find real zeros; graph  $x$ -intercepts
- ② Find  $y$ -intercept =  $f(0)$   $x = 0$
- ③ End behavior / also multiplicity

End behavior  $\cdot x^n$

$n$  is even behaves like  $x^2$   $\uparrow \uparrow$  or  $\downarrow \downarrow$

$n$  is odd behaves like  $x^3$

+ like  $+x^2$  or  $+x^3$   
- like  $-x^2$  or  $-x^3$

## Multiplicity

$$(x-2)^1$$



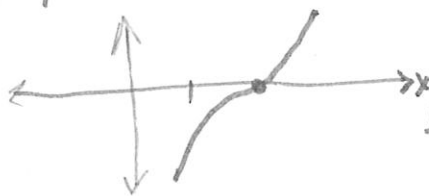
cross  $x$ -axis

$$(x-2)^2$$



bounce / tangent

$$(x-2)^3$$



crosses and is tangent "wiggle"

If multiplicity (exponent) is odd  $\rightarrow$  crosses  
even  $\rightarrow$  bounces

3.4 **Ex 3**

Graph  $f(x) = 2x^3 + 5x^2 - x - 6$

① Possible Rational Zeros:  $\frac{p}{q} \rightarrow \frac{\pm 1 \pm 2 \pm 3 \pm 6}{\pm 1 \pm 2}$

$\hookrightarrow \pm(1, 2, 3, 6, \frac{1}{2}, \frac{3}{2})$

$$\begin{array}{r|rrrr} 1 & 2 & 5 & -1 & -6 \\ & & 2 & 7 & 6 \\ \hline & 2 & 7 & 6 & 0 \end{array}$$

$f(x) = (x-1)(2x^2 + 7x + 6)$

a	b	c	ac	b
↓	↓	↓	12	7
$2x^2 + 7x + 6$			3.4	$3+4=7$
$\frac{2x^2}{x}$	$+ \frac{3x}{x}$	$+ \frac{4x}{x}$	$+ \frac{6}{x}$	
$x(2x+3) + 2(2x+3)$				
$(2x+3)(x+2)$				

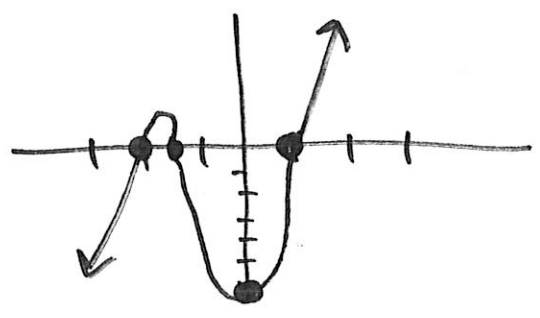
**$f(x) = (x-1)(2x+3)(x+2)$**

$0 = (x-1)(2x+3)(x+2)$

$x-1=0$   
+1 +1  
 **$x=1$**

$2x+3=0$   
-3 -3  
 $\frac{2x}{2} = \frac{-3}{2}$   
 **$x = -\frac{3}{2}$**

$x+2=0$   
-2 -2  
 **$x = -2$**



② y-intercept,  $x=0$

$f(0) = 2(0)^3 + 5(0)^2 - 0 - 6$

$f(0) = -6$

③ End Behavior  $2x^3$

Down-Up, since exponents are odd

3.4

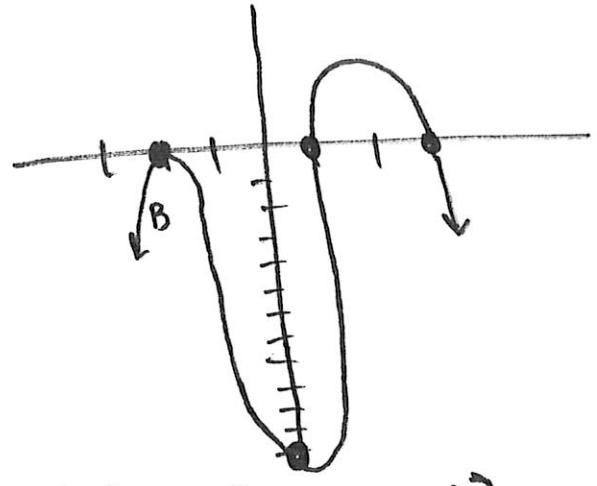
**Ex 4**

Day 2

3

Graph  $f(x) = -(x-1)(x-3)(x+2)^2$

① zeros  $x=1$   $x=3$   $x=-2$



② y-intercept  
 $x=0$

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

$$= -(-1)(-3)(4)$$

$f(0) = -12$   $(0, -12)$  y-intercept

③ End behavior  $-(x)(x)(x)^2 = -x^4$

Bounce? yes  $\rightarrow (x+2)^2$   
Bounce at  $x = -2$