

We need...

	Term with highest Degree	exponent odd Degree
Coefficient Pos	↖ ↗	↘ ↗
Coefficient Neg	↙ ↘	↙ ↘

* End Behavior

* Zeros/Roots/Solutions
X-intercepts & multiplicities
~ factor > to find them
~ use ART
Multiplicities Matter

m.1 m.2 m.3

cut through x-axis line x² parabola bounce (like x³ wiggle)

* Y-intercept
X=0 (0, -)
Y= *choose a scale

Sketch
ex. $f(x) = x^4 + 5x^3 - 24x^2$

Step 1: End Behavior
x⁴ pos. even ↗

Step 2: Find x-intercepts (factor, use ART) set each factor = 0

Step 3: y-int
x=0 y=0 (0,0)

Step 4: Plot roots (x-ints)

Step 5: Sketch end behavior

Step 6: Sketch in cuts/bounces at the roots

$x^2(x^2 + 5x - 24)$
 $x^2(x+8)(x-3)$
 $x=0$ $x+8=0$ $x-3=0$
 $x=0$ $x=-8$ $x=3$
(m,2) (m,1) (m,1)
bounce cut cut

Jan 30-10:09 AM

Name: _____ Date: _____ Unit 6 Class Work

Graphing Polynomials Class Work

Objective: You will be able to sketch graphs of polynomials.

* Turn & Talk: What are some aspects of a polynomial that can help you determine certain points on its graph?

* To sketch graphs of polynomial functions, we will need to identify the following aspects:

- _____
- _____ (if reasonable)
- If the function is positive (above the x-axis) or negative (below the x-axis) between each pair of roots (according to multiplicities) You can test points to check too!
- End behavior: Determined by the leading coefficient and degree of the polynomial

If the leading coefficient is positive:

- even degree: both ends of the graph point up
- odd degree: left side points down and right side points up

If the leading coefficient is negative:

- even degree: both ends of the graph point down
- odd degree: left side points up and right side points down

*Example: Sketch a graph of the function $y = -x^3 - 2x^2 + x + 2$

① End Beh.
-x³ neg. odd
↘ ↗

② x-int.
-x²(x+2) + 1(x+2)
common factor
(x+2)(-x²+1)=0
x=-2 -x²=-1
 x²=1
 x=±1

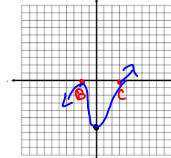
③ y-int
x=0 (0,2)
y=2

④ Sketch ends then insides

x = -1, 1, -2
all m.1
all cuts

Practice: Sketch a graph of each function.

1. $f(x) = x^3 + x^2 - 8x - 12$



$x = -2$ (m.z.) $x = 3$

① End x^3 pos odd \nearrow

③ y-int $x=0$ $y=-12$ (0, -12)
y-scale: 1 unit = 2

② Intercepts possible: $\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$

④ sketch ends then rest

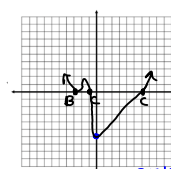
$$x^2 - x - 6 = 0$$

$$(x-3)(x+2)$$

$$x=3 \quad x=-2$$

x	-2	-1	0	1	2	3
$f(x)$	-8	-6	-12	-8	0	12

2. $y = 3x^3 + x^2 - 9x - 2 = 0$



x scale: 1 unit = 1/3

① $3x^3$ pos even \uparrow

③ y-int $x=0$ $y=-2$ (0, -2)

② x-int. (factors) possible: $\pm 1, \pm 2, \pm 1/3, \pm 2/3$

④ sketch ends

$x = -1, 2, 1/3$ (m.z.) plot on graph

x	-1	$-2/3$	$-1/3$	0	$1/3$	$2/3$	1	2
$f(x)$	-2	-2	-2	-2	0	2	2	2

Not factorable use RAT

$$3x^3 - 2x^2 - 7x - 2 = 0$$

x	-1	$-2/3$	$-1/3$	0	$1/3$	$2/3$
$f(x)$	-2	2	2	2	0	2

$$3x^2 - 5x - 2 = 0$$

$$x = \frac{5 \pm \sqrt{25 + 24}}{6}$$

$$x = \frac{5 \pm 7}{6} = \frac{12}{6} \text{ and } \frac{-2}{6}$$

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Recap:

List the important aspects of sketching graphs of polynomial functions.