② $-x^9$

E.B. $\uparrow\downarrow$

Domain: $(-\infty,\infty)$

Range: $(-\infty,\infty)$

$\lim_{x\to-\infty} f(x)=\infty \uparrow$

$\lim_{x\to\infty} f(x)=-\infty \downarrow$

$\boxed{\lim_{x\to}} f(x)=$

---

⑨ $f(x)=x^2(x-2)$

Degree $=3$

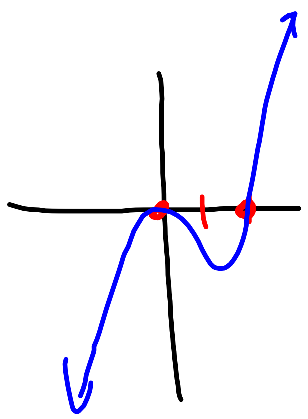
$2 + 1 =$

bounce tangent

straight

L.C. $+$

E.B. $\downarrow\uparrow$



(10) $-(x+1)(x-2)(x-3)$

$1 + 1 + 1$

Degree = 3

EB: $\uparrow \downarrow$

L.C. $-$

3-3 Graphing Polynomial Functions from Standard Form

Objectives:

- I can find the zeroes of a polynomial by using the factor theorem, remainder theorem, and rational roots theorem

-I can then graph the polynomial by hand once I have found the zeros

Discussion:

In order to GRAPH $x^3 - 8x^2 + 19x - 12$ by hand, what information do we need? zeros, type of intersection E.B

What form do we need the polynomial to be in? Factored form (find zeros)

How can we get it to that form?

Recall: Finding the Zeros of a Polynomial

-Factoring: Find GCF first, then may use special factoring, factoring by grouping, or quadratic factoring

-Factor Theorem

-Remainder Theorem

Use to test a factor from rational roots theorem

-Rational Roots Theorem: Helps determine possible rational roots using $x = \pm \frac{\text{factors of constant}}{\text{factors of leading coefficient}}$

Recall: Graphing a polynomial from factored form

-Find zeros by setting factors equal to zero and solving

-Use degree to determine end behavior

-~~Sign Charts~~

-Multiplicity

Ex. Find the zeros of the polynomial, then graph by hand

$$f(x) = -x^5 + -7x^4 + -12x^3$$

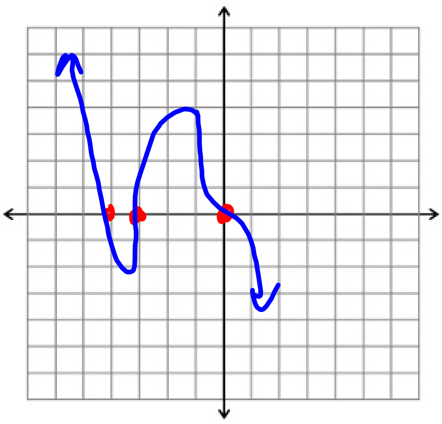
$$-x^5 - 7x^4 - 12x^3$$

$$-x^3(\underbrace{x^2 + 7x + 12})$$

$$-x^3(x+3)(x+4)$$

zeros: $0, -3, -4$

m3 m1 m1



E.B. ↑ ↓

Ex. Find the zeros of the polynomial, then graph by hand

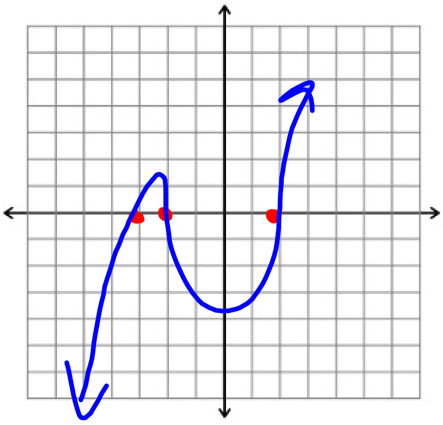
$$f(x) = x^3 + 3x^2 - 4x - 12$$

$x^2(x+3) - 4(x+3)$

$(x+3)(x^2-4)$

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

$x = -3, 2, -2$



E.B. $\downarrow \uparrow$

Ex. Find the zeros of the polynomial, then graph by hand

$$f(x) = x^4 + 4x^3 + x^2 - 6x$$

$x(1x^3 + 4x^2 + x - 6)$

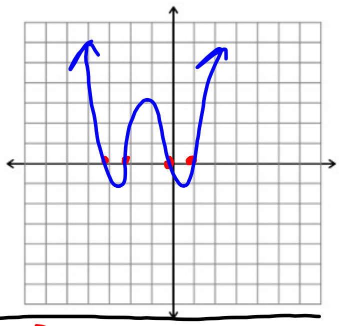
$(x^3 + 4x^2) + (x - 6)$

$x^2(x+4) + 1(x-6)$

Possible RR: $\pm 1, \pm 2, \pm 3, \pm 6$

$x = 0, 1, -2, -3$

E.B. $\uparrow \uparrow$



$$\begin{array}{r|rrrr} 1 & 1 & 4 & 1 & -6 \\ + & \downarrow & 1 & 5 & 6 \\ \hline & 1x^2 + & 5x + & 6 & \boxed{0} \end{array}$$

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

$-2 \quad -3$

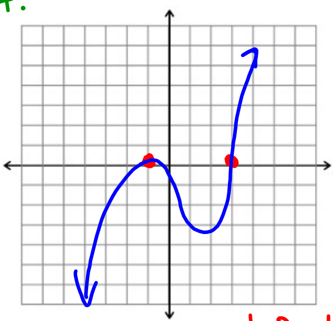
You Try! Find the zeros of the polynomial, then graph by hand

L.C. const.

$$f(x) = 1x^3 - x^2 - 5x - 3$$

$$\cancel{x^2(x-1) - 1(5x+3)}$$

EB: ↓↑



Possible RR

$\pm 1, \pm 3$

$$\begin{array}{r|rrrr} -1 & 1 & -1 & -5 & -3 \\ + & \downarrow & -1 & 2 & 3 \\ \hline & 1x^2 & -2x & -3 & \boxed{0} \end{array}$$

zeros: $-1, 3, -1$

m 2 (tangent)

$(x - 3)(x + 1)$

$3 \qquad -1$

$(x-3)(x+1)^2$