Sec 2.3 day 3: Finding the zeros of a function

Solve for x:

$y = x^2 - 5x - 6$

EB ↑↑

$x^2 - 5x - 6 = 0$

x	y
6	0
-1	0

$(x - 6) \cdot (x + 1) = 0$

a · b = 0

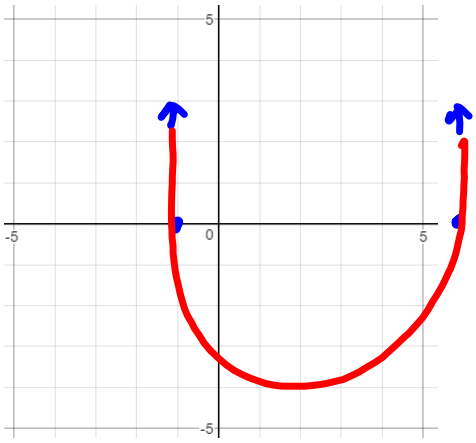
$x - 6 = 0$
$+6 \quad +6$

$x + 1 = 0$
$-1 \quad -1$

root → $x = 6$
x-int, zeros

$x = -1$

Zero Product Prop
$a \cdot b = 0$
$a = 0 \quad b = 0$



Find the zeros of the function:

EB ↓ ↑

$$x^3 - 4x = 0$$

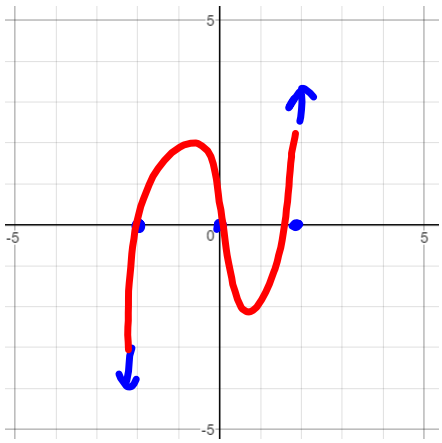
$$x(x^2 - 4) = 0$$

$$x \cdot (x+2)(x-2) = 0$$

zeros

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

$x = -2$ $x = 2$



Sec 2.3 con't

→ roots or x-intercepts

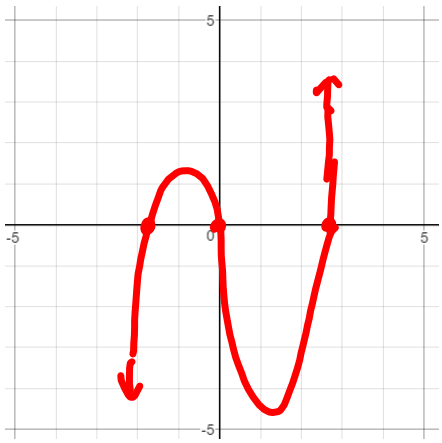
Finding the zeros of a function

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

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

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

$x = 0, 3, -2$ EB ↓↑



Multiplicity of a Zero (where the graph may bounce)

If a factor is repeated, even times the graph bounces
odd times - goes through

$x^3 \cdot x^2 = x^5$

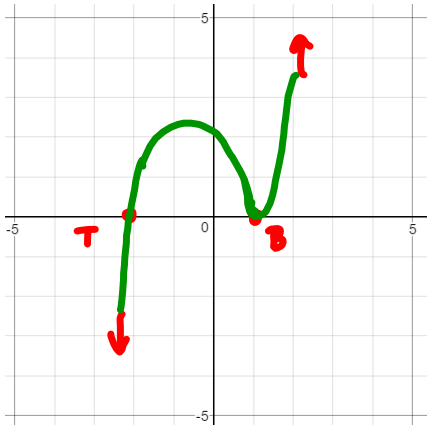
ex. $f(x) = (x + 2)^3(x - 1)^2$

$x^5 + \cdots = \underbrace{(x+2)(x+2)(x+2)}_{x=-2}\underbrace{(x-1)(x-1)}_{x=1} = 0$

EB ↓↑

$x=-2$ mult of $\underline{3}$ T

$x=1$ mult of $\underline{2}$ B



Factor by grouping:

$$\underbrace{x^3 + 2x^2}\ \underbrace{- 4x - 8} = 0$$

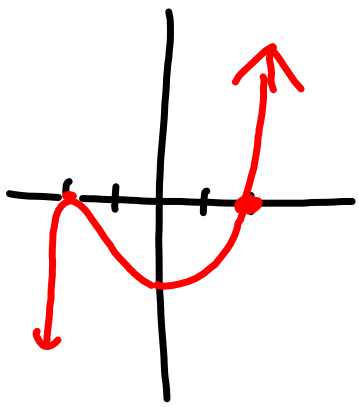
$$x^2(x+2) - 4(x+2) = 0$$

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

$$\underbrace{(x+2)(x+2)}(x-2) = 0$$

$x = -2$ mult of 2 B

$x = 2$ mult of 1 T



$x^2 \cdot 8x^3 \cdot x$ $\uparrow\uparrow$

$f(x) = (x+4)^2(2x-6)^3(x-1) = 8x^6 + \ldots$

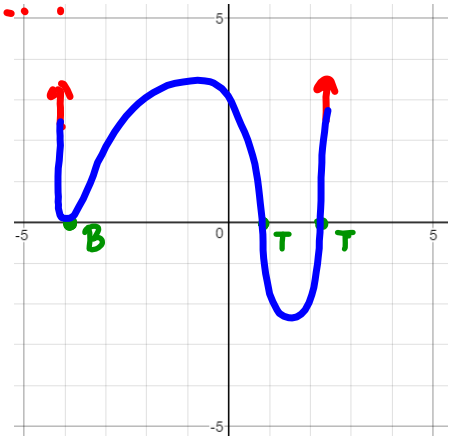
$2x-6=0$

$x=3$

$x =$ -4 mult of 2 B

$x =$ 3 mult of 3 T

$x =$ 1 mult of 1 T



Homework. Label as Sec 2.3 day 3

In Exercises 33–38, find the zeros of the function algebraically.

33. $f(x) = x^2 + 2x - 8$

35. $f(x) = 9x^2 - 3x - 2$

37. $f(x) = 3x^3 - x^2 - 2x$

In Exercises 39–42, state the degree and list the zeros of the polynomial function. State the multiplicity of each zero and whether the graph crosses the x-axis at the corresponding x-intercept. Then sketch the graph of the polynomial function by hand.

39. $f(x) = x(x - 3)^2$

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