

## Graphs & Characteristics of Polynomial Functions (B)

- find the zeros by factoring and describe the multiplicity of each zero,
- find the x and y intercepts,
- describe the end behavior of the polynomial,
- sketch the graph (use specific points!),
- determine the domain and range,
- identify any maximums or minimums
- identify where the function increases and decreases.

Ex 1:

$$f(x) = 4x^4 + 5x^3 - 42x^2 - 45x + 54$$

Can it  
factor  
further?

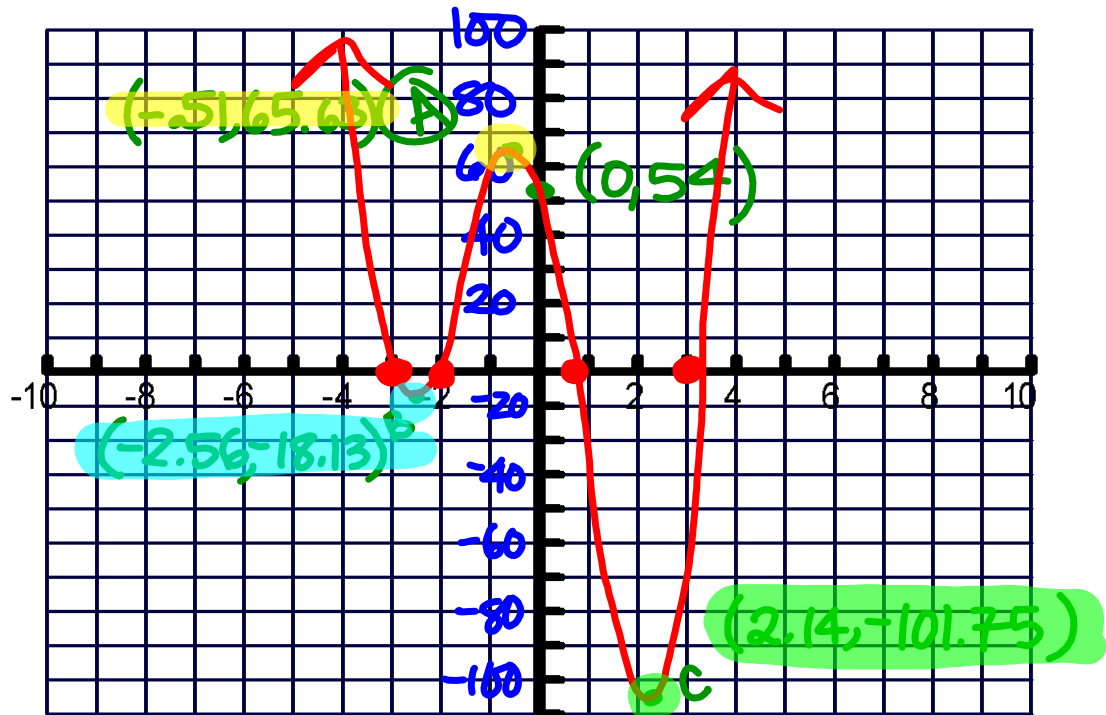
$$f(x) = (4x - 3)(x^3 + 2x^2 - 9x - 18)$$

$$= (4x - 3)(x^2 - 9)(x + 2)$$

D.O.T.S.

Factored Form:  $f(x) = (4x - 3)(x + 3)(x - 3)(x + 2)$

Zeros:  $x = \frac{3}{4}, \pm 3, -2$



### Characteristics

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

R:  $[-101.75, \infty)$

y - int:  $(0, 54)$

x - int:  $(\pm 3, 0)$   $(\frac{3}{4}, 0)$

zeros:  $x = \frac{3}{4}, \pm 3, -2$   $(-2, 0)$

end behavior:  $x \rightarrow -\infty$   $y \rightarrow +\infty$   
 $x \rightarrow +\infty$   $y \rightarrow +\infty$

A  $(-5.1, 65.63)$  B  $(-2.56, -18.13)$

C  $(2.14, -101.75)$

int. inc:  $(-2.56, -0.51) \cup (2.14, \infty)$  int. dec:  $(-\infty, -2.56) \cup (-0.51, 2.14)$

max: none  
extrema relative  $(-0.51, 65.63)$

min:  $(2.14, -101.75)$  relative  $(-2.56, -18.13)$   
extrema

Ex. 2  $f(x) = -x^5 - 6x^4 - 4x^3 + 24x^2 + 32x$

$$f(x) = (x + 2)(-x^4 - 4x^3 + 4x^2 + 16x)$$

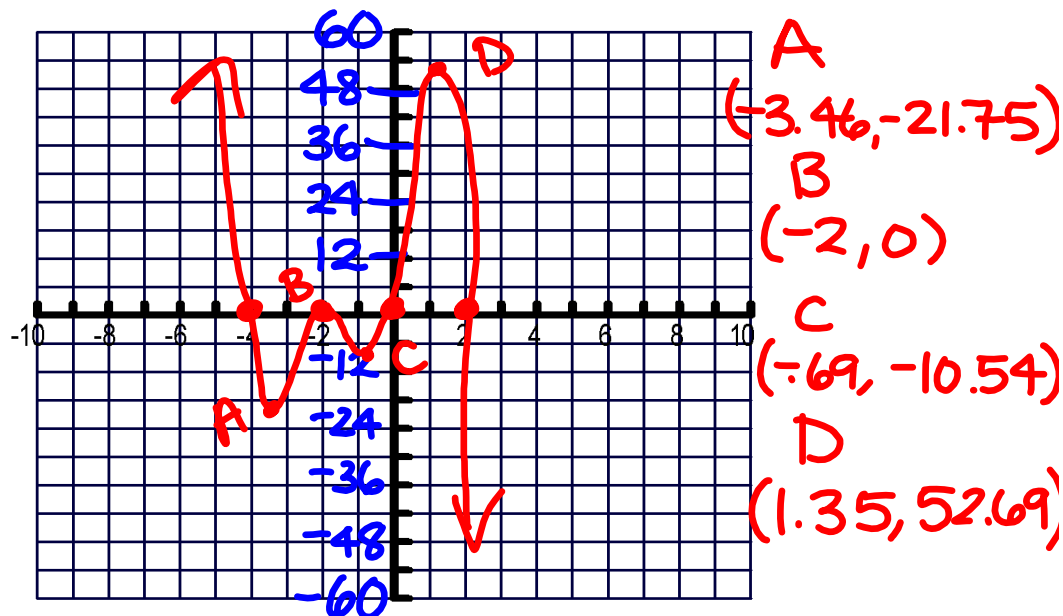
Can it  
factor  
further?

$$= (x+2) - x(x^3 + 4x^2 - 4x - 16)$$

←  $-x(x+2)$

Factored Form:  $f(x) = -x(x-2)(x+4)(x+2)^2$

Zeros:  $x = 0, 2, -4, -2$  <sup>mult</sup> <sub>of 2</sub>



## Characteristics

D:  $(-\infty, \infty)$       R:  $(-\infty, \infty)$

y - int:  $(0, 0)$       x - int:  $(0, 0)$   $(-2, 0)$

zeros:  $x = 0, \pm 2, -4$        $(2, 0)$   $(-4, 0)$

end behavior:  $x \rightarrow -\infty$   $y \rightarrow +\infty$   
 $x \rightarrow +\infty$   $y \rightarrow -\infty$

int. inc:

$(-3.46, -2) \cup (-.69, 1.35)$

max: ~~global~~  
 ex      none

min: ~~global~~  
 ex      none

int. dec:

$(-\infty, -3.46) \cup (-2, -.69) \cup$   
 $(1.35, \infty)$

local  
 relative  
 max:  $(-2, 0)$   $(1.35, 52.69)$

local  
 relative  
 min  $(-3.46, -21.75)$   
 $(-.69, -10.54)$