Section 4.1: Polynomial Functions and Models

Monday, January 26, 2015
1:13 PM

and 4.2: Graphing Polynomial Functions

polynomial function ≡ a single term or a sum of terms in which the exponents on any variables are positive integers

examples:

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

degree

$$P(x) = 5x^{10} - 2x^7 + 3x - 5$$

leading coefficient

constant term

$$Q(x) = \pi x^{17} - \frac{\sqrt{2}}{2} x$$

note: coefficient are real (don't have to be integers)

non-examples:

$$f(x) = x^{\pi} + 4$$

$$g(x) = \frac{2}{x}$$

$h(x) = 5\sqrt{x}$

vocabulary: if degree is 1, $P(x)$ is linear
2 quadratic
3 cubic
≥ 4 polynomial of degree

graphs of polynomial functions:

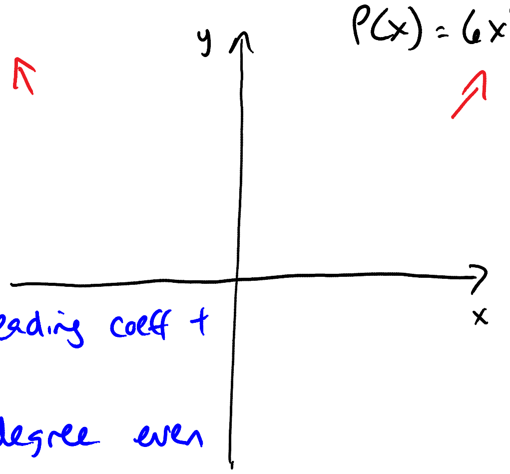
- they are continuous and smooth

no hops, skips, or jumps

what you think it means (no pointy bits)

end behavior:

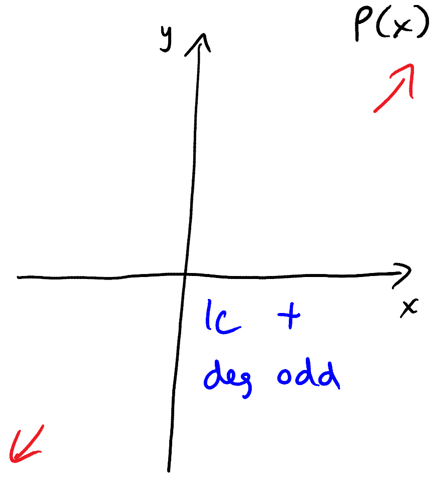
$P(x) = 6x^6 - x^3$



leading coeff +

degree even

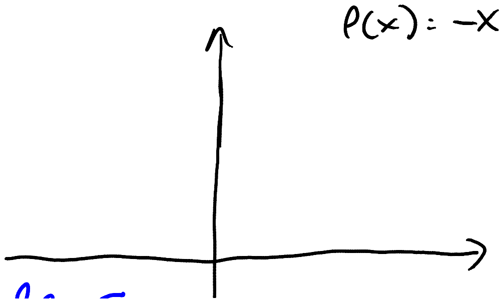
$P(x) = 3x^5 + x^4$



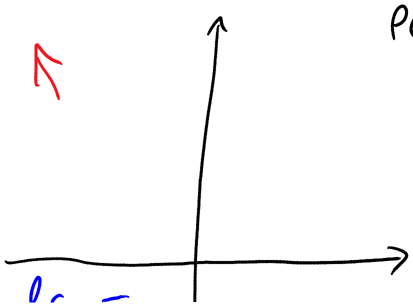
lc +

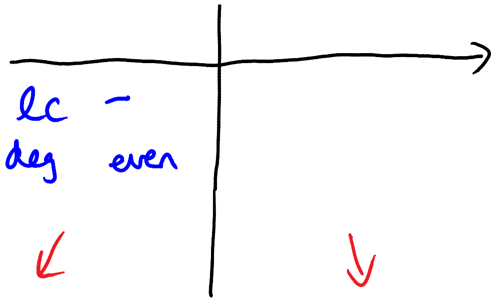
deg odd

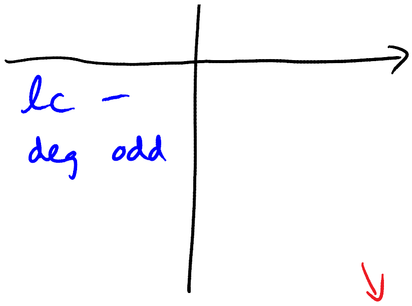
$P(x) = -x^2 + 1$



$P(x) = -10x^3 - 5x$







finding zeros of polynomial functions:

→ find values of x for which $f(x) = 0$
(x-intercepts of graph)

example: find the zeros of

$$P(x) = 3x(x-2)^2(x+3)$$

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

$$x = 0,\ \underbrace{2,\ 2}_{\text{repeated zero}},\ -3$$

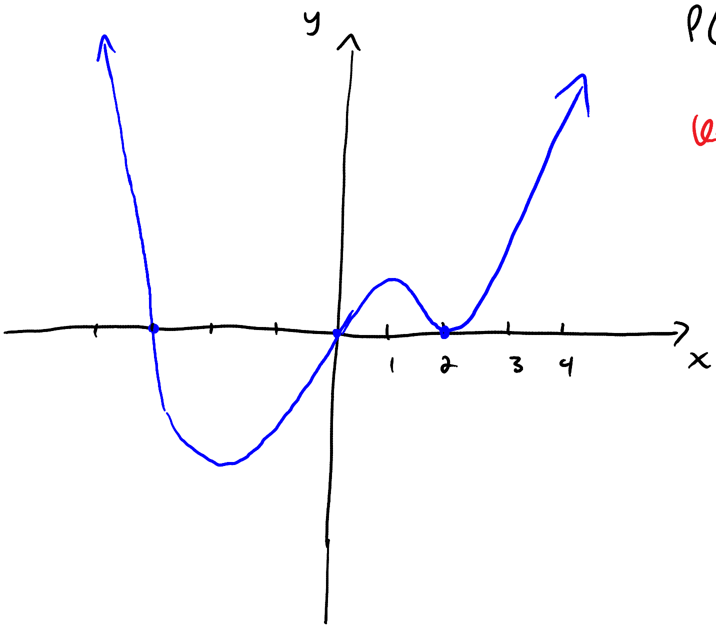
multiplicity: for any zero, its multiplicity is the exponent of the zero's factor
(number of times the zero is repeated in the solution set)

for previous example:

$x = 0, \quad 2, \quad -3$

↑ mult 1 ↑ mult 2 ↑ mult 1

why do we care?



$P(x) = 3x(x-2)^2(x+3)$

leading term is $3x^4$

end behavior:

$\uparrow \quad \uparrow$

if mult is odd $\rightarrow$ graph crosses axis at that zero

" " " even $\rightarrow$ touches