Week 5 Thursday

February 7, 2019 7:39 AM

Check www.camosun.ca for weather updates

Quiz Tues 4.3

Ch 5 ~~Polynomials~~

Ch 5 Polynomials and Rational Functions

polynomial / polynomial

5.1 Polynomial Functions Cont'd

Goal: Graph Polynomials

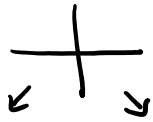
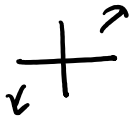
4 Basic Graphs:

$y=x^2$ $y=-x^2$ $y=x^3$ $y=-x^3$

End behaviour of a function: how graph looks as $x \to \pm\infty$

4 possible end behaviours for a polynomial:

degree	leading coefficient	end behaviour	classic ex
even	⊕	↑ ↑	$y=x^2$

even	$\ominus$		$y=-x^2$
odd	$\oplus$		$y=x^3$
odd	$\ominus$		$y=-x^3$

Definition:
If r is a real # for which $f(r)=0$ then
r is a <u>real zero</u> of $f(x)$

FACT: The following are equivalent:

1) r is a real zero of $f(x)$
2) $f(r)=0$
3) r is an x-intercept of $f(x)$
4) $x-r$ is a factor of $f(x)$

<u>Quick Ex</u>: $f(x)=(x-2)(x+3)$

- $f(2)=0$
- 2 is an x-intercept of $f(x)$
- 2 is a "real zero" of $f(x)$

- $f(-3)=0$
- -3 is an x-int.
- -3 is a "real zero" of $f(x)$

<u>Ex</u>: a) Find a polynomial of degree 3

whose zeros are $-7, 0$ and 3

$f(x) = ?\,(\quad)(\quad)(\quad)$

$= a(x+7)\,x\,(x-3)$

b) Find the leading coefficient if $f(1) = -32$

Sub $f=-32$, $x=1$:

$-32 = a(8)(1)(-2)$

$-32 = -16a$

$2 = a$

Summary: $f(x) = 2(x+7)x(x-3)$

Definition:

Multiplicity of a zero (real zero) $x=r$:

exponent on the factor $x-r$

Ex: $f(x) = 12(x-4)^2(x+5)^1$

Real zeros : $4, -5$

Multiplicity of $x=4$: 2

" $x=-5$: 1

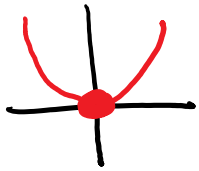
FACT:

At a real zero of **odd** multiplicity, graph **crosses** x-axis

even **touches**

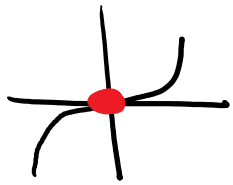
Quick Ex: $y = x^2$

$x=0$ is a zero of multiplicity 2 (EVEN)



$y = x^3$

$x=0$ is a zero of multiplicity 3 (ODD)

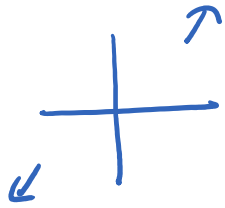


Ex: Graph $f(x) = 12(x-4)^2(x+5)$

1) End behaviour

$f(x) = 12x^3 + \cdots$

$f(x) \approx 12x^3$

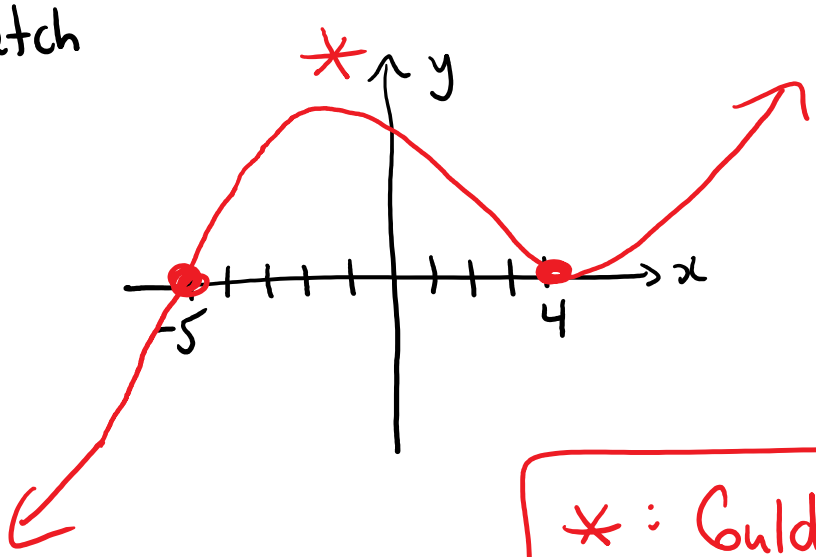


2) x-intercepts (graph crosses/touches x-axis)

$x=4$ has even multiplicity (graph touches x-axis)

$x=-5$ odd crosses

3) Sketch



* : Could plot more points