10/01/2018

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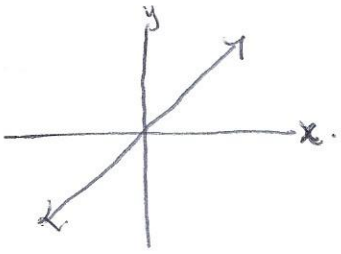
MATH 2311
Pre-Calculus I
Ms. Palmer

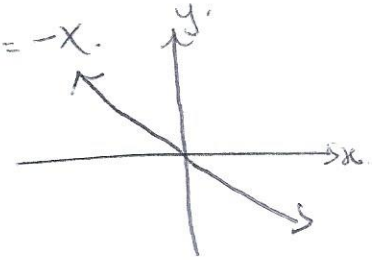
2.2 : Intro to polynomials.

Examples of polynomial functions:

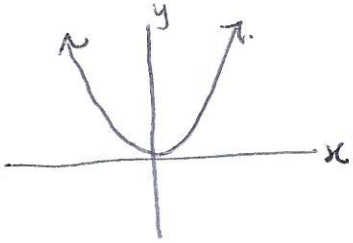
$f(x) = x$ linear function.



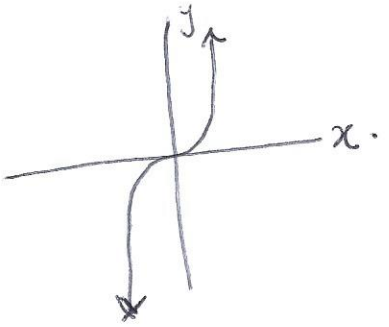
$f(x) = -x$.



$f(x) = x^2$. Quadratic



$f(x) = x^3$ Cubic function.



All polynomial functions:

Base: Variable.

exponent: positive whole number.

Coefficients: real numbers.

standard form:

$y = a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} + \dots + a_1 x + a_0$.

a_n : coefficients.

$y = ax^2 + bx + c$

End behaviour.

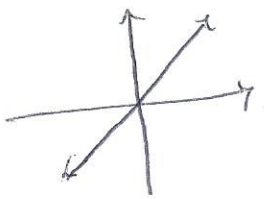
Highest exponent odd: opposite eg: $f(x) = x^1$

* Leading coefficient : positive.

  Left: down Right: up.

  $x \to -\infty$ $x \to \infty$

  $y \to -\infty$ $y \to \infty$

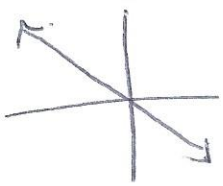


* Leading coefficient : negative. eg: $f(x) = -x$.

  Left: up. Right: down.

  $x \to -\infty$ $x \to \infty$

  $y \to \infty$ $y \to -\infty$



Highest Exponent: Even (same direction).

Leading coefficient: positive.

Left: up.
$x \to -\infty$
$y \to \infty$

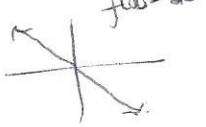
Right: up.
$x \to \infty$
$y \to \infty$

Leading Coefficient: negative.

Left: down
$x \longrightarrow -\infty$
$y \longrightarrow -\infty$

Right: down.
$x \longrightarrow \infty$
$y \longrightarrow -\infty$

Ex: $f(x) = (-3x^5) + 4x^3 - 2x + 9$.

End behaviour: 5 exp. opposite eg. 

leading coef: neg

Left: up:
$x \to -\infty$
$y \to \infty$

Right: down.
$x \longrightarrow \infty$
$y \longrightarrow -\infty$

Factored form: $f(x) = (x-c_1)^a (x-c_2)^b \cdots (x-c_n)^k$

Ex: $f(x) = (x-3)^2 (x+4)^3 (-2x+5)$.

Leading term: $(1x)^2 (1x)^3 (-2x)^1 = x^2 \cdot x^3 \cdot (-2x)$.

$= -2x^6$

End behaviour: Left: down Right: down.

as $x \to -\infty$, $y \to -\infty$ $x \to +\infty$, $y \to -\infty$.

Zeros: x – intercepts

factor = 0, solve for x.

$f(x) = (x-3)^2(x+4)^3(-2x+5)$.

Zeros: $x-3=0$ $x+4=0$ $-2x+5$

$x=3$ $x=-4$ $x=\frac{5}{2}$ or 2.5.

mult. of 2 mult. of 3 mult. of 1.

Multiplicity: Number of times a zero occurs.

exponent on the factor in factored form.

Multiplicity is odd: Cross x – axis.

Multiplicity is even: bounce off x – axis.

$f(x) = (x-3)^2(x+4)^3(-2x+5)$.

$x=2.5$

$x=3$. $x=-4$ Mul of 1.

mult of 2 Mult of 3

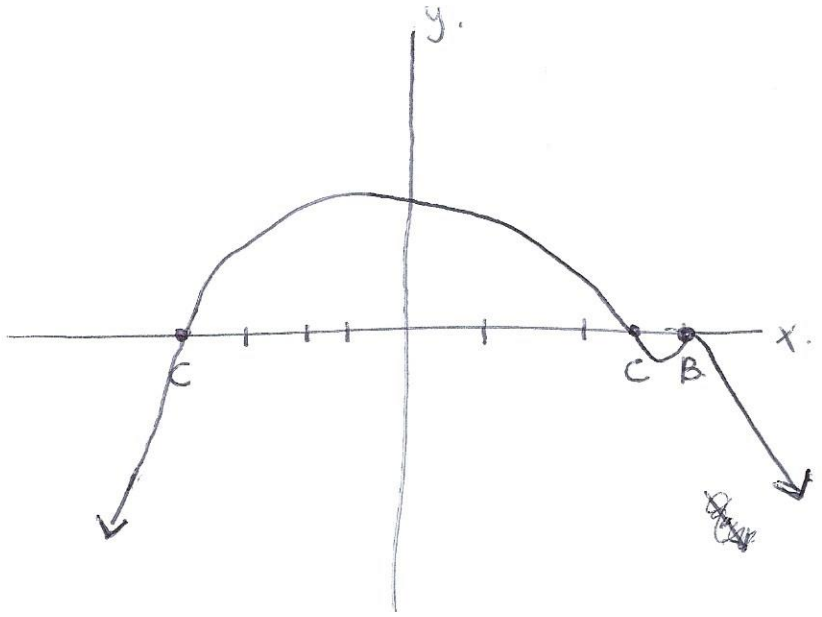
bounce. Cross

Cross

End behaviour: $(x^2)(x^3)(-2) = -2x^6$.

L: D R: D.

Graph:



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

Determine the end behaviour, Zeros and their multiplicities and then sketch the graph.

EB: $(x)^4(x^2)(x^1) = x^7$. L: D R: U

Zeros: $x-2=0$ $x+1=0$ $x+5=0$

$x=2$. $x=-1$. $x=5$.

mult of 4. mult of 2. multi of 1

bounce. bounce cross.