M3H Unit 3 Modeling with Polynomials

Polynomial Graphs

SWBAT: Graph polynomials given their degree, end behavior, zeros, multiplicity.

WARM UP: M2H Review

Sketch these Polynomial Graphs – check with your

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

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

$f(x) = x^4$ $f(x) = x^5$

$f(x) = x^6$ $f(x) = x^7$

So...End Behavior depends on:

1)

2)

Describe the end behavior:

Ex.1 $f(x) = x^3$

$x \to \infty, y \to$

$x \to -\infty, y \to$

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

$x \to \infty, y \to$

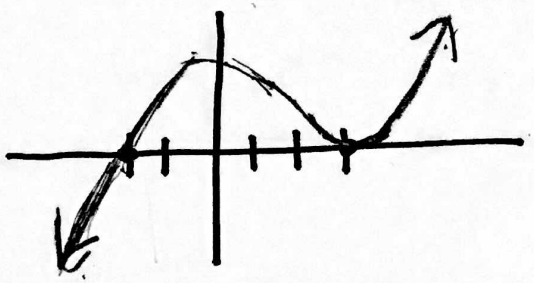
$x \to -\infty, y \to$

$y = (x-3)^4(x+2)^1$

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

Degree: 5 (odd)

LC: 1 ⊕



$x-3=0$ x-int

$x = 3$ (multiplicity of 4) even

$x+2=0$

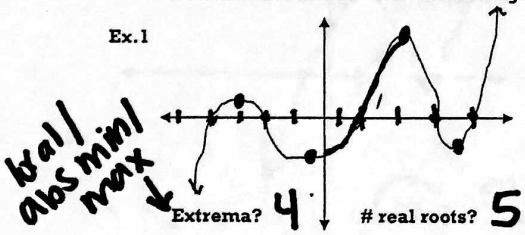
$x = -2$ (multiplicity of 1) odd

Extrema:

Local min, MAX - a low/high on an interval

Absolute min/MAX – THE lowest/highest on the entire graph

Ex.1



Extrema? 4 **# real roots?** 5

 # Turns? 4 **Possible degree?** 4+1 = 5

End behavior? $x \to \infty, y \to \infty$ $x \to -\infty, y \to -\infty$

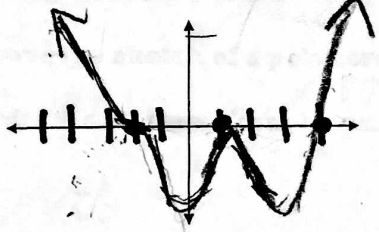
What is the relationship between the degree and the number of turns?

degree = # of turns + 1

* **Multiplicity – how many times particular root will occur.** (look at exponent of each factor)

- **Odd multiplicity: the graph will...** go right through the x-axis
- **Even multiplicity: the graph will...** touch and turn
- **The higher the degree of a factor...** the more flattening at the zero (bigger than 1 or 2)

Ex.2 $P(x) = (x-1)^2(x+2)^3(x-4)$



Determining Multiplicity from the Graph

1	$x = 4$
2	$x = 1$
3	$x = -2$

degree? 6 (even) LC: 1 ⊕

End behavior?

Zeros?

$x-1=0$

$x = 1$ (mult 2) even

$x+2=0$

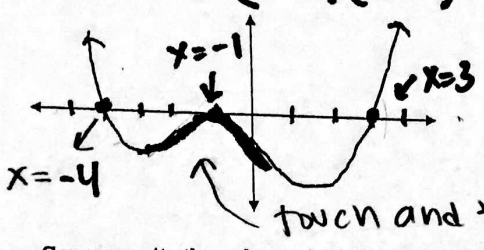
$x = -2$ (mult 3) odd

$x-4=0$

$x = 4$ (mult 1) odd

Can we determine whether the graph indicates a ....

Ex.3 $P(x) = (x+4)(x+1)^2(x-3)$



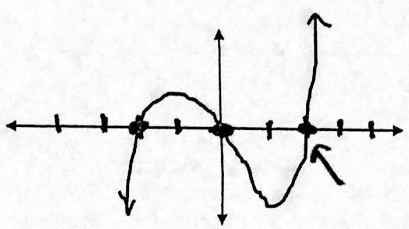
Degree? $3+1=4$

End behavior? $x \to \infty \ y \to \infty$ $x \to -\infty \ y \to \infty$

Zeros? $(-4,0)\ (-1,0)\ (3,0)$

Can you write the polynomial in factored form?

Ex.4 $P(x) = (x)(x+2)(x-2)$



Degree? 3

End behavior? ↓ ↑

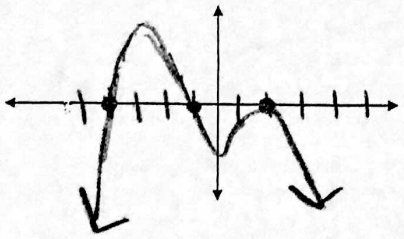
Zeros?

$x=2$

$x=0$

$x=-2$

Ex.5 $P(x) = -(x+1)(x+4)(x-2)^2$



Degree? 4

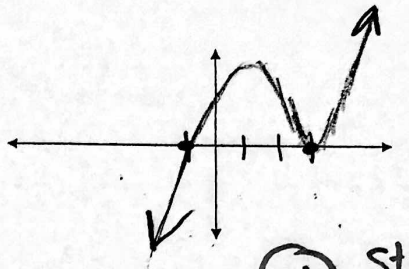
End behavior? ↓ ↓

Zeros? $x=-1$ (mult 1)

$x=-4$ (mult 1)

$x=2$ (mult 2)

Ex.6 $P(x) = (x-3)^2(x+1)$



Degree? 3 LC (+)

End behavior? ↓ ↑

Zeros? $x=3$ (mult 2) even

$x=-1$ (mult 1)

ex Standard form:

$y=-(x-3)^2(x+1)$

$y=-(x-3)(x-3)(x+1)$

IN CLOSING...

If we have the factored form of a polynomial,

We can sketch the graph by using ...

- zeros
- degree
- multiplicity
- leading coefficient

$y=-(x^2-6x+9)(x+1)$

$y=-(x^3+x^2-6x^2-6x+9x+9)$

$y=-(x^3-5x^2+3x+9)$

$y=-x^3+5x^2-3x-9$

If we have the sketch of a polynomial, we ↙ equation

Can write the factored form by using...

- zeros
- degree
- end behavior
- behavior at x-intercepts (tells you multiplicity)