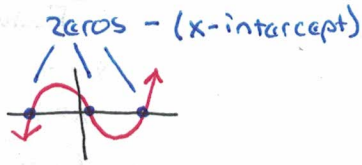
# Polynomial Functions and Graphs

## LEADING TERMS & MULTIPLICITY:

- The leading (LC) coefficient of a polynomial is the coefficient of the term with the highest degree. *SHOULD BE IN STANDARD FORM*
  - The LC of $9x^3 + 7x^2 + 10x$ is 9 (leading coeff.). degree of 3 (cubic)




- Multiplicity refers to the number of times a zero occurs within a polynomial.
  - Example: $(x-1)^2(x+2)^3$ has a zero at x = 1 with a multiplicity of 2 and a zero at x = -2 with a multiplicity of 3.

$(x-1)(x-1)$

$x-1=0 \rightarrow x=1$ w/multi of 2

$(x+2)^3 \rightarrow (x+2)(x+2)(x+2)$

$x+2=0 \rightarrow x=-2$ w/multi 3

List each of the following's degree, number of terms, LC, and multiplicity.

*The Degree of a polynomial tells you how many ZEROS a polynomial has.*

| | Degree | # of terms | LC | Multiplicity |
|---|---|---|---|---|
| 1. $3x + x^2 + 2$ | 2 (Quadratic) | 3 | 1 | |

$x^2+3x+2$ FACTOR $\rightarrow (x+2)(x+1)$

$x+2=0 \rightarrow x=-2$ w/multi of 1

$x+1=0 \rightarrow x=-1$ w/multi of 1

| | | | | |
|---|---|---|---|---|
| 2. $6a^2$ | 2 (Quadratic) | 1 | 6 | $a=0$ w/multi of 2 |

$\frac{6a^2}{6} = \frac{0}{6} \rightarrow a^2 = 0 \rightarrow a = 0$

| | | | | |
|---|---|---|---|---|
| 3. $4y+3y$ | 1 (Linear) | 1 | 7 | $y=0$ w/multi of 1 |

$7y \quad 7y=0 \quad y=0$

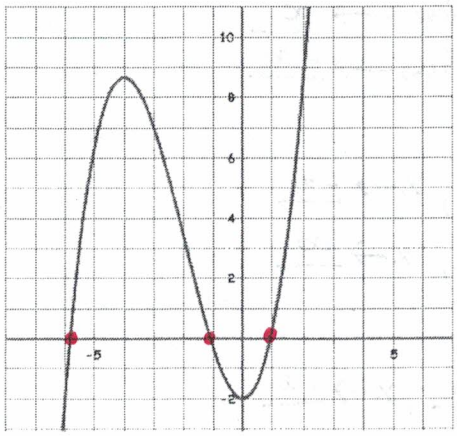
| | | | | |
|---|---|---|---|---|
| 4. $5t^4-2t^3-3t^2$ | 4 (Quartic) | 3 | 5 | $t=0$ w/multi of 2; $t=-3/5$; $t=1$ |

$t^2(5t^2-2t-3) \longrightarrow t^2(5t+3)(t-1) \rightarrow t^2=0 \quad 5t+3=0 \quad t-1=0$

$t=0 \quad t=-\frac{3}{5} \quad t=1$

## ZEROS:

- Zeros, also known as ROOTS, are the points on the graph of a polynomial function that CROSS or TOUCH the x-axis.
- Looking at the graph below, how many REAL zeros does this function have?




Since the function crosses/touches the x-axis 3 times, there are 3 REAL ZEROS.