

## SM3-A VOCABULARY 3-1 (Analyzing Polynomials)

Polynomial: An equation (or an expression) with same-base powers being added that are raised to a natural number exponent.

Example:  $y = 8x^5 + 5x^4 + 9x^3 + x^2 + 2x + 3$

**Not** a polynomial  $y = x^{0.5} + 3x^{2/3} + 6\sqrt{x}$

Lead coefficient: the coefficient of the largest power.

$$y = -8x^5 + 5x^4 + 9x^3 + x^2 + 2x + 3$$

Degree: the largest exponent of the polynomial.

Standard Form Polynomial A polynomial ordered so that the exponents get smaller from the left-most term to the right-most term.  $y = 8x^5 + 5x^4 + 9x^3 + x^2 + 2x + 3$

Term: powers (or the constant) separated by either a '+' or '-' symbol.

Number of terms: If all terms are present, a 2<sup>nd</sup> degree polynomial as 3 terms in standard form.

$$y = 2x^2 - 4x + 5$$

If you include the number zero as a possible coefficient, an "n-th degree polynomial has n+1 terms (i.e., a 3<sup>rd</sup> degree has 4 terms).  $y = 4x^3 + 0x^2 - 4x + 5$

Intercept Form Polynomial A polynomial that has been factored into linear factors, from which you can identify the input values that make the output value equal to zero.

Example:  $y = 6(x + 4)(x + 3)(x - 2i)(x + 2i)$

Linear factors: the exponent of the power is a '1'.

Why do we call these linear factors?

$$y = mx + b$$

The linear equation is a 1<sup>st</sup> degree polynomial so  $(x + 2)$  is a linear factor

Solve by factoring: If the equation has only one variable ('y' has already been set to zero), solve by factoring means to convert a standard form polynomial into intercept form (by factoring) and then identifying the zeroes of the polynomial.

$$y = 6x^4 + 42x^3 + 96x^2 + 28x + 48$$
$$0 = 6(x+4)(x+3)(x-2i)(x+2i)$$
$$x = -4 \quad x = -3 \quad x = 2i \quad x = -2i$$

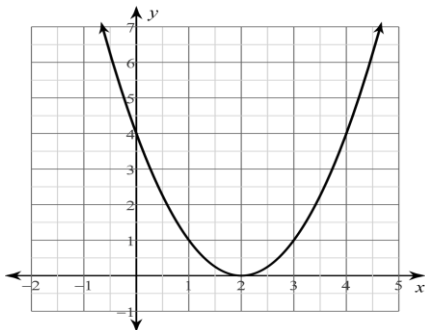
Find the zeroes: means that the equation has two variables. 1<sup>st</sup> step: set  $y = 0$ , then solve by factoring.

If the polynomial is already in intercept form: "solve by factoring" means just find the zeroes.

$$0 = (x+5)(x-2)(x-\sqrt{3})(x+\sqrt{3})$$
$$x = -5 \quad x = 2 \quad x = \sqrt{3} \quad x = -\sqrt{3}$$

The "end behavior" of a function means: "on the right end of the graph is the y-value going UP or DOWN? And "on the left end of the graph, is the y-value going UP or DOWN?"

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



In English we could say: "up on right, up on left"

As 'x' gets bigger (right end) 'y' gets bigger (goes upward)

As 'x' gets smaller (left end), 'y' gets bigger (goes upward)