

Chapter 2

Polynomials and Polynomial Functions

2.1 Using Exponents

- **Properties; Rules**

- 1. $x^5 \cdot x^3 = x^8$ (add powers)

- 2. $(x^5)^3 = x^{15}$ (multiply powers)

- 3. $(2x^5)^3 = 2^3 \cdot x^{15}$ (distribute)

- 4. $a^0 = 1$

- 5. $a^{-1} = \frac{1}{a}$

- 6. $\left(\frac{x^5}{x^3}\right) = x^2$ (subtract powers)

- 7. $\left(\frac{2x^5}{y^3}\right)^3 = \frac{2^3 x^{15}}{y^9}$ (distribute)

2.2 Evaluating and Graphing Polynomial Functions

- Polynomial Function:
 - Standard Form (highest to lowest)
 - Exponents (whole numbers)
 - Leading coefficient (real)
 - Types; linear, quadratic, cubic, quartic

- **Evaluate:**

- Plug in
- Synthetic Substitution

- **Graph:**

- End Behavior: n is odd (opposite)
- n is even (same)
- x | y chart

2.3 Operations on Polynomials

- Adding (Like Terms)
- Subtracting (Like Terms)
- Multiplying (Distribute..then combine like terms)

2.4 Factoring and Solving Polynomial Equations

Factoring:

- Types:
- 1. GCF
- 2. Regular FOIL
- 3. Difference of Squares: $x^2 - y^2 = (x + y)(x - y)$
- 4. Perfect Square: $x^2 + 2xy + y^2 = (x + y)^2$
- 5. Sum or Difference of Cubes: $x^3 + y^3 = (x + y)(x^2 - xy + y^2)$
- 6. Grouping: 4 terms

- **To Solve**

- 1. standard form = 0

- 2. Factor 1.GCF 2.FOIL

- 3. Set each factor = 0

2.5 The Remainder and Factor Theorems

- quotient $q(x)$ + remainder $r(x)$
- $d(x)$ –divisor $\sqrt{f(x)polynomial}$
- 2 kinds of division: (why: to find factors)
 - Long
 - Synthetic

- Remainder Theorem:
 - If polynomial $f(x)$ is divided by $(x-k)$,
 - Then $f(k) = r$ (remainder)
- Factor Theorem:
 - If polynomial $f(x)$ has a factor $(x-k)$,
 - Then $f(k) = 0$

Asked to do 2 Things

- **To Factor:** factors: break polynomial into factors
 - May have to use synthetic division to find factors
 - () () ()
- **To Solve:** solutions: must be factored to solve
 - Find $x = , , ,$
 - Find Roots
 - Find Zeros
 - Find x-intercepts

2.6 Finding Rational Zeros

- To start to find factors: Factor to Solve
 - List all **POSSIBLE** rational zeros
 - Factors of last number (constant)
 - Factors of first number (leading)
- Test by using synthetic division $r = 0$
- Ex: Solution: 6 -2 $\frac{3}{2}$
- Factor: $(x-6)$ $(x + 2)$ $(2x - 3)$

2.7 Fundamental Theorem of Algebra

- Every polynomial has a solution; real or complex
- The degree of a polynomial indicates the number of solutions in the complex numbers
- (real and imaginary)
- Repeated solutions,
- Imaginary and irrational come in conjugates (pairs)

2.8 Graphs of Polynomials

- Sketch graphs
- Know end behavior
- Know x and y intercepts
- Know curves; turning points
- maximum and minimum
- To find max or min values use graph

Summary

- Zero: k Ex: 5
- Factor: $(x - k)$ Ex: $(x - 5)$
- Solution: k to $f(x) = 0$ Ex: 5
- X-intercept: $(k, 0)$ Ex: $(5, 0)$