

# Math 0995 CBE 2 Review

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UtahStateUniversity

# CBE 2

- Covers lessons 7-13
  - Polynomials
  - Multiplying Polynomials
  - Dividing Polynomials
  - Factors and the GCM
  - Factor by Grouping
  - Factoring Trinomials
  - “Special” Factoring Formulas

# Polynomials

Definition, Multiplying, and Dividing

# What are Polynomials?

- Polynomial are a finite (or ending) sum of terms where each consists of a variable (usually  $x$ ) raised to some power, with a constant coefficient
  - Example:  $4x^3 + 2x^2 + x + 1$
- Terms: The things that are added and subtracted. The coefficient and variable together make up one term.
- Coefficient: The numbers in front of the variable.
- Degree: the highest power in the polynomial.

# Problem 1

- Subtract the polynomials and simplify the expression:

$$(5m^5 + 4m^3 - m) - (2m^2 + 6m - 7)$$

- Remember we are subtracting the whole polynomial on the right

- Solution:  $5m^5 + 4m^3 - 2m^2 - 7m + 7$

# Problem 2

- Determine the value of the polynomial

$$3x^2 + 6x - 10 \text{ when } x = 2$$

- Solution: 14

# Multiplying Polynomials

- Multiplication is commutative, which means that the result is the same no matter what order they are multiplied
  - $3 \times 5 = 5 \times 3 = 15$
  - $(3x + 7)(x - 1) = (x - 1)(3x + 7)$
- When multiplying polynomials, we use the distributive property
  - $a(b + c) = ab + ac$
  - $(e+f)(g+h) = e(g+h) + f(g+h) = eg + eh + fg + fh$

# Problem 3

- Multiply and simplify the expression:  $(4y^2 + 10)(3y^2 + 2y - 1)$

- Solution:  $12y^4 + 8y^3 + 26y^2 + 20y - 10$

# Problem 4

- What is the area of a rectangle with width =  $4x - 6$   
and length =  $2x + 9$
- Remember that for a rectangle, area = width x length

- Solution:  $8x^2 + 24x + 54$

# Dividing Polynomials

- Dividing polynomials by a monomial (one term):
  - Divide into each term in the numerator (distributive property)
  - Simplify each term (looking for common factors)
- Dividing polynomials by polynomials:
  - We CANNOT just divide individual terms with each other (we are dividing by the entire quantity)
  - Instead, we use long division
  - Similar to long division with numbers. Remember to include your remainder when finished

# Problem 5

- Divide and simplify the following expression:  $\frac{8x^5 + 6x^2 + 5}{4x^4}$

- Solution:  $2x + \frac{3}{2x^2} + \frac{5}{4x^4}$

# Problem 6

- Use polynomial division to write the following fraction as a polynomial plus a fraction where the numerator has a smaller power than the denominator:

$$\frac{2x^3 + 4x^2 - 6}{x + 1}$$

- Solution:  $2x^2 + 2x - 2 - \frac{4}{x+1}$

# Factoring

Factors, GCM, Factor by Grouping, Trinomials, and Special Formulas

# Factors

- Factors are the numbers that multiply together to make a number
- We think about undoing multiplication. In other words, we look at what will divide evenly into our number and then write it as a product of those divisors
- The Greatest Common Factor is the largest factor a group of numbers all have in common

# Factoring Trinomials (3 Terms)

- First write in descending order
- Then we want to UNfoil
  - When the leading coefficient is 1:
    - Find factors of the last term that add to the middle term
  - If the leading coefficient is not 1:
    - If we can, we want to factor out the coefficient.
    - If we can't factor out the coefficient:
      - Find factors of the leading coefficient multiplied by the last term that add to the middle term

# Problem 7

- Fully factor the polynomial:  $x^2 - 5x + 6$

- Solution:  $(x - 2)(x - 3)$

# Problem 8

- Fully factor the polynomial:  $6x^2 + 11x - 10$

- Solution:  $(3x - 2)(2x + 5)$

# Factor by Grouping

- We factor by grouping when there are four terms.
- We can group together different terms to factor something out from just that group
- Typically, there will be two group that factor to at least one of the same factors, so then we can use the distributive property to factor further

# Problem 9

- Fully factor the polynomial:  $6xy + 30y - 4x - 20$

- Solutions:  $(x + 5)(6y - 4)$

# Special Factoring Formulas

- Difference of squares:

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

- Perfect square trinomials:

$$x^2 + 2xy + y^2 = (x + y)^2$$

$$x^2 - 2xy + y^2 = (x - y)^2$$

# Problem 10

- Fully factor the following polynomial:  $12x^5 - 18x^4 + 6x^3$

- **Solution:**  $6x^3(2x - 1)(x - 1)$

# Other Resources

- Aggie Math Learning Center
  - Visit [usu.edu/math/amlc](http://usu.edu/math/amlc) for more videos, resources, tutoring times, and recitation leader office hours

