

# Warm-Up!

- Identify each function as linear or exponential.

1.  $f(x) = 2^x$

2.  $f(x) = 5x + 3$

Combine Like terms

1.  $2x + 3 - 5x$

2.  $4z - 5 + 3z - 6 + 2z - 7 + z - 8$

# Algebra I CC Unit 9

## Polynomial Functions

### **Lesson 1**

Add, Subtract, and Multiply

# Polynomial Functions

## Examples

- $f(x) = 2x + 6x^2$
- $y = 9x^3 + 7x^2 + 8x - 1$
- $g(x) = 3x^4 - \sqrt{5}x + 4x^5$

## Non Examples

- $f(x) = 2\sqrt{x} + 6x^2$
- $y = 7x^{-2} - 1 + 8x + 9^x$
- $g(x) = 4 - 5x + \sqrt{2}x^{\sqrt{5}}$

# Standard Form for Polynomial Functions

## Examples

- $f(x) = 2x + 6$
- $y = 9x^3 + 7x^2 + 8x - 1$
- $g(x) = 3x^4 - 5x + 4$

## Non Examples

- $f(x) = 6 + 2x$
- $y = 7x^2 - 1 + 8x + 9x^3$
- $g(x) = 4 - 5x + 3x^4$

# Leading Coefficient for Polynomial Functions

- $f(x) = 2x + 6$ 
  - Leading Coefficient is 2
- $y = 9x^3 + 7x^2 + 8x - 1$ 
  - Leading Coefficient is 9
- $g(x) = -3x^4 - 5x + 4$ 
  - Leading Coefficient is -3
- $f(x) = x^3 + 9x^2 - 1$ 
  - Leading Coefficient is 1

# Degree for Polynomial Functions

- $f(x) = 2x + 6$ 
  - Degree is 1
- $y = 9x^3 + 7x^2 + 8x - 1$ 
  - Degree is 3
- $g(x) = -3x^4 - 5x + 4$ 
  - Degree is 4
- $f(x) = x^3 + 9x^2 - 1$ 
  - Degree is 3

# Notes

## Evaluating and Graphing Polynomial Functions

Degree	Type	Standard Form
		$f(x) = a_0$
		$f(x) = a_1x + a_0$
		$f(x) = a_2x^2 + a_1x + a_0$
		$f(x) = a_3x^3 + a_2x^2 + a_1x + a_0$
		$f(x) = a_4x^4 + a_3x^3 + a_2x^2 + a_1x + a_0$

**Standard Form-**

**Leading Coefficient-**

**Degree –**

**Polynomial –**

Are the following polynomial functions? If so, write the function in standard form and state its degree, type, constant and leading coefficient.

1.  $f(x) = \frac{1}{2}x^2 - 3x^4 - 7$

2.  $f(x) = x^3 + 3x^{-4}$

3.  $f(x) = 6x^2 + 2x^4 + x$



Are the following polynomial functions? If so, write the function in standard form and state its degree, type, constant and leading coefficient.

1.  $f(x) = -3w + 7$

2.  $f(x) = 7x - 2^x$

3.  $f(x) = 7y + 2y^3 - y^2 + 3y^4$

# Working with Polynomials

- Add the polynomials

$$(3x^2 + 2x^2 - x - 7) + (x^3 - 10x^2 + 8)$$

# Working with Polynomials

- Add the polynomials

$$(2x^2 + x - 5) + (x + x^2 + 6)$$

# Working with Polynomials

- Add the polynomials  
 $(5x^3 - x + 2x^2 + 7) + (3x^2 + 7 - 4x) + (4x^2 - 8 - x^3)$

# YOUR TURN

- Add the polynomials

1.  $(x^2 - 4x + 3) + (3x^2 - 3x - 5)$

2.  $(12x^3 + 10) + (18x^3 - 3x^2 + 6)$

3.  $(-9z^3 - 3z) + (13z - 8z^2)$

4.  $(10w^3 + 20w^2 - 55w + 60) +$   
 $(-25w^2 + 15w - 10) + (-5w^2 + 10w - 20)$

# Working with polynomials

- Subtract the polynomials

$$(8x^3 - 3x^2 - 2x + 9) - (2x^3 + 6x^2 - x + 1)$$

# Working with polynomials

- Subtract the polynomials

$$(-3x^2 + x + 8) - (x^2 - 8x + 4)$$

# Working with polynomials

- Subtract the polynomials

$$(2a^4 - 2a + 7) - (3a^4 + 6a^3) - (2a^2 - 7)$$



# YOUR TURN

- Subtract the polynomials

1.  $(3x^2 + 7x - 6) - (3x^2 + 7x)$

2.  $(a + 3a^2 + 2a^3) - (a^4 - a^3)$

3.  $(21t^4 - 3t^2 + 43) - (19t^3 + 33t - 58)$

# Warm Up

- Simplify

1.  $3(x + 4)$

2.  $x(x + 4)$

3. Add your 2 answers

# Working with Polynomials

- Multiply the Polynomials

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

# Working with Polynomials

- Multiply the Polynomials

$$(3x + 4)(x + 5)$$

# Working with Polynomials

- Multiply the Polynomials

$$(x - 2)(5 + 3x - x^2)$$

# Working with Polynomials

- Multiply the Polynomials

$$(-x^2 + 2x + 4)(x - 3)$$

# Practice

- Multiply the polynomials

$$(x^2 + x + 1)(x + 1)$$

# Practice

- Multiply the polynomials  
 $(2x^2 + 3x + 2)(x^2 - 2)$



# Practice

- Multiply the polynomials

$$(x^2 + 4x + 1)(2x^2 - x + 5)$$

# Try

- Simplify

$$(3x^2 + 2x) + 2(x^2 - 4x)$$

# You try

- Multiply the Polynomials

1.  $2x(x^2 - 8x + 1)$

2.  $(z + 8)(z + 5)$

3.  $(a + 3)(a - 7)$

4.  $(2c - 9)(3c - 4)$

5.  $(x^2 + 4)(x^2 - 2x + 3)$

# You try

1.  $(5x^2 + x - 7) + (-3x^2 - 6x - 1)$

2.  $(3x^3 + 8x^2 - x - 5) - (5x^3 - x^2 + 17)$

3.  $(4x^2 + x - 5) * (2x + 1)$

# Working with Polynomials

- Multiply the Polynomials  
 $(x + 2)^2$

# Working with Polynomials

- Multiply the Polynomials

$$(x - 5)^2$$

# Working with Polynomials

- Multiply the Polynomials

$$(2x + 1)^2$$

# Working with Polynomials

- Multiply the Polynomials  
 $(5x - 3)^2$



# You Try

- Multiply the Polynomials

1.  $(x + 8)^2$

2.  $(y - 4)^2$

3.  $(3a - 7)^2$