Unit 6: Polynomials and Polynomial Functions

Day 1 – Evaluating Polynomial Functions

Objectives: SWBAT identify polynomial functions
SWBAT evaluate polynomial functions.
SWBAT find the end behaviors of polynomial functions.

Polynomial

Polynomial Function Notation

All powers of *x* are _____ numbers.

Leading Coefficient

Degree

Defining Polynomials

Polynomial	# of terms	Name by # of terms	Degree	Name by degree	Leading Coefficient
12					
$8x$					
$4x^2 + 3$					
$5x^3 + x^2$					
$3x^2 - 4x + 6$					
$3x^4 - 4x^3 + 6x^2 - 7$					
$3x^5 + 3\sqrt{x}$					
$11x^2 - 5x^{-1}$					

Decide whether the function is a polynomial function. If so write it in standard form, then state its degree, type, and leading coefficient.

1. $f(x)=3x^3+4x^{2.5}-6x^2$

Is it a polynomial	Standard Form	Number of terms	Degree	Leading Coefficient

2. $f(x)=x^2+3.7x+9x^4$

Is it a polynomial	Standard Form	Number of terms	Degree	Leading Coefficient

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

Is it a polynomial	Standard Form	Number of terms	Degree	Leading Coefficient

4. $f(x)=-2x^3+2x^2-3x^4+5\sqrt{x}$

Is it a polynomial	Standard Form	Number of terms	Degree	Leading Coefficient

Direct Substitution

Use direct substitution to evaluate the functions below for the given value.

4. $f(x)=3x^4-x^3+2x^2+4;\ \ x=2$

b. $f(x)=-x^3+2x^2+2x-1;\ \ f(-2)$

Polynomial Synthetic Substitution

Use synthetic substitution to evaluate the functions below for the given value.

6. $f(x)=2x^4-5x^3-4x+8;\ x=3$

7. $g(x)=x^4+3x^3-4x^2-x;\ x=-2$

c. $g(x)=x^2+5x^4+6x-1;\ g(4)$

9. $f(x)=64x^4-8x^2-4x;\ f\left(\frac{1}{2}\right)$

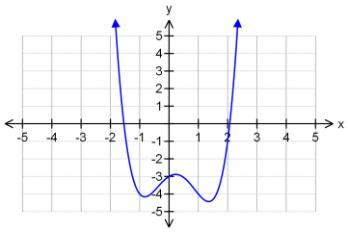
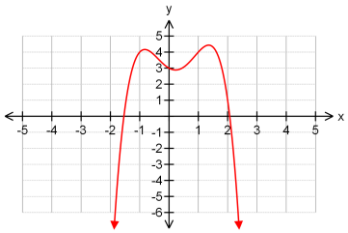
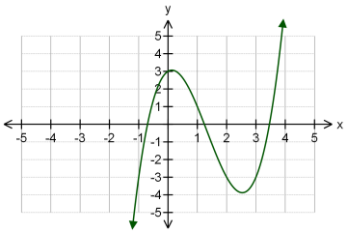
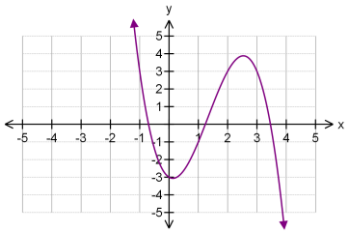
Day 2 – Graph Polynomial Functions

Objectives: SWBAT graph polynomial functions
SWBAT state the end behavior of polynomial functions

Degree **Leading Coefficient** **End Behavior**

Name	General Shape	Leading Coefficient	
		Positive	Negative
Quadratic			
Cubic			
Quartic			

End behavior of Polynomial function

	END BEHAVIOR	
	Positive Leading Coefficients	**Negative Leading Coefficients**
EVEN DEGREE	 **Left** $x \to -\infty$ **row** $x \to \infty$ **What is happening to the graph?** $f(x) \to$ _____ $f(x) \to$ _____	 **Left** $x \to$ **row** ∞ **What is happening to the graph?** $f(x) \to$ _____ $f(x) \to$ _____
ODD DEGREE	 **Left Arrow** $x \to -\infty$ **Right Arrow** $x \to \infty$ **What is happening to the graph?** $f(x) \to$ _____ $f(x) \to$ _____	 **Left Arrow** $x \to -\infty$ **Right Arrow** $x \to \infty$ **What is happening to the graph?** $f(x) \to$ _____ $f(x) \to$ _____

Draw a mental picture, then write the End Behavior for the functions below without graphing them:

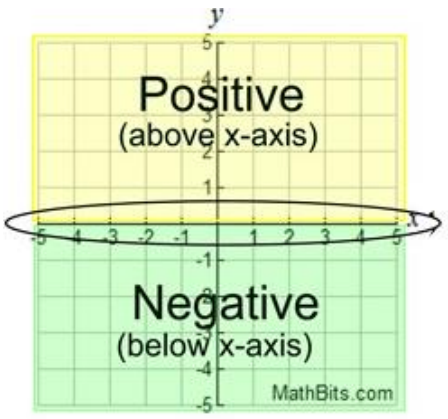
1. $y = -6x^{20} + 55x^{11} - 18$ **2.** $f(x) = x^7 + 13x^6 + 5x - 2$ **a.** $f(x) = -2x^3 + x^2 - 11x + 7$

Zeros

Positive Interval

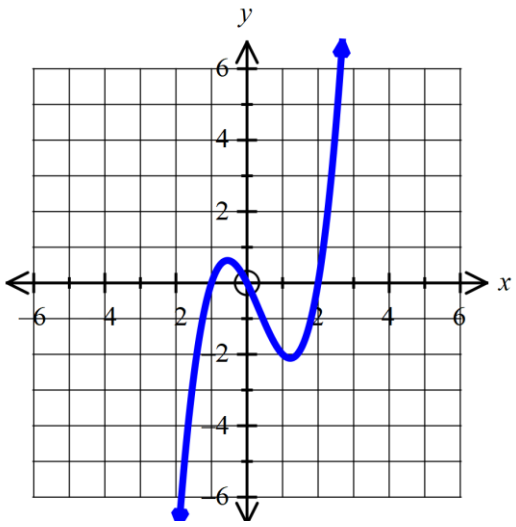
Negative Interval

Zeros



Find the positive and negative intervals:

3.

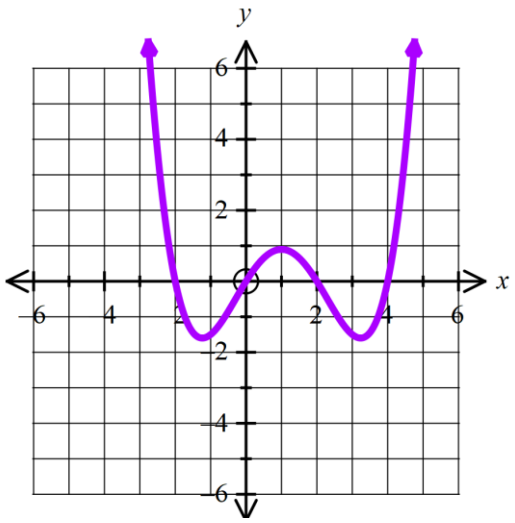


Zeros:_____

Positive: _____

Negative: _____

4.



Zeros:_____

Positive: _____

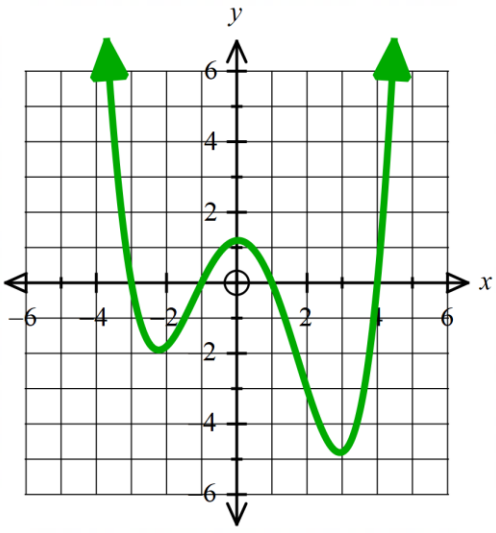
Negative: _____

b)

Zeros: _____

Positive: _____

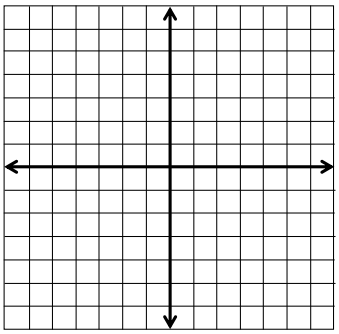
Negative: _____



Graph the following polynomial functions by creating a table, then describe their end behavior.

1. $f(x) = -x^3 - 2x^2 + x + 2$

x	–3	–2	–1	0	1	2	3
f(x)							



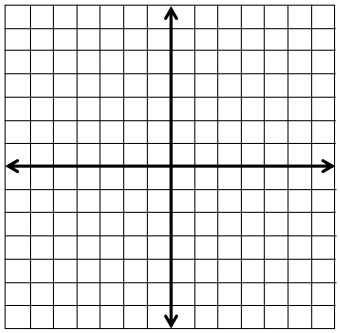
On what interval is f(x) positive? _____

On what interval is f(x) negative? _____

$f(x) \to$ ___ as $x \to -\infty$ and $f(x) \to$ ___ as $x \to \infty$

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

x	–3	–2	–1	0	1	2	3
f(x)							



Positive f(x)? _____

Negative f(x)? _____

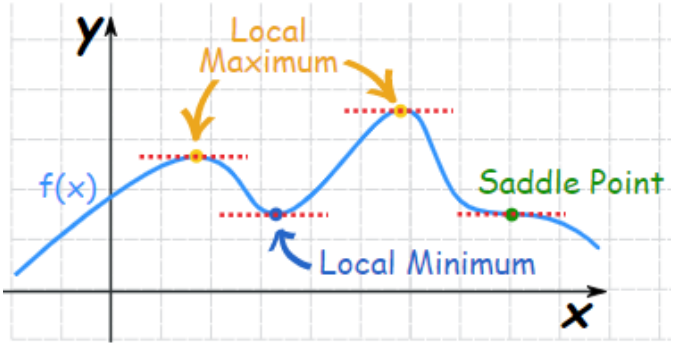
$f(x) \to$ ___ as $x \to -\infty$ and $f(x) \to$ ___ as $x \to \infty$

Day 3 – Important Parts on the Graph of a Polynomial Function

Objectives: SWBAT identify relative minimum and maximum
SWBAT state when a graph is increasing and decreasing

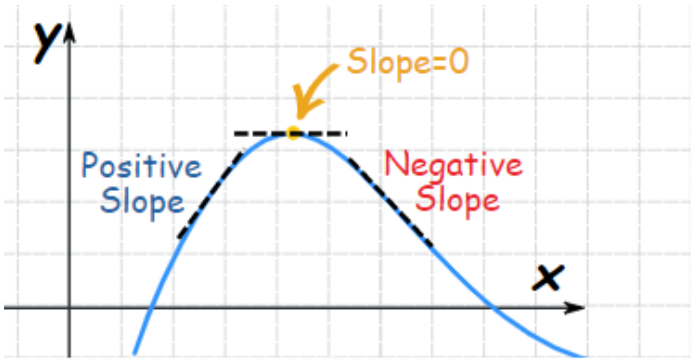
Local Minimum/ Minima

Local Maximum / Maxima



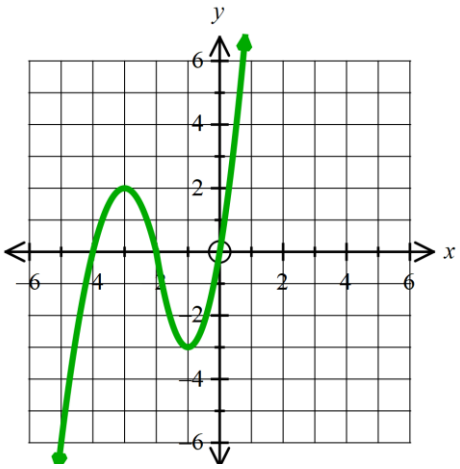
Increasing Intervals

Decreasing Intervals



Find the local maxima, and minima. Then find when the graph is increasing and decreasing.

1.



Maxima: _____

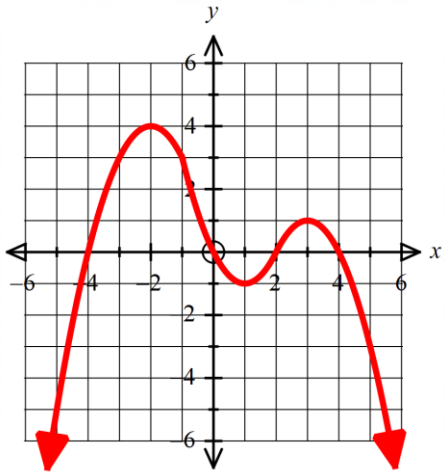
Minima: _____

Increasing: _____

Decreasing: _____

End Behavior: _____

2.



Maxima: _____

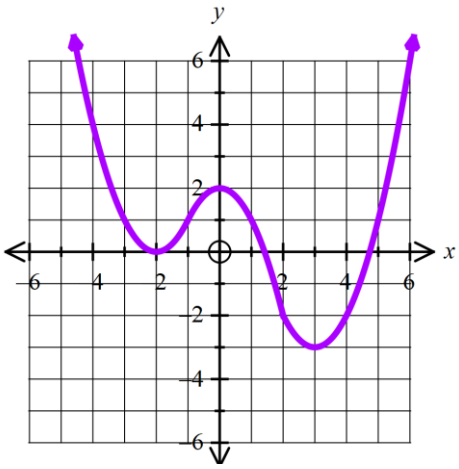
Minima: _____

Increasing: _____

Decreasing: _____

End Behavior: _____

a.



Maxima: _____

Minima: _____

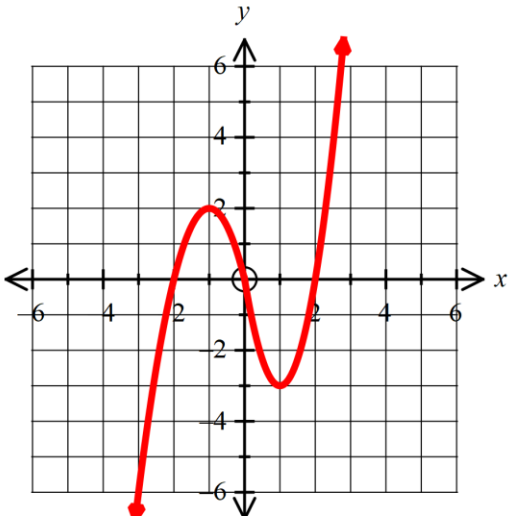
Increasing: _____

Decreasing: _____

End Behavior: _____

Using the graph below, find all of the following.

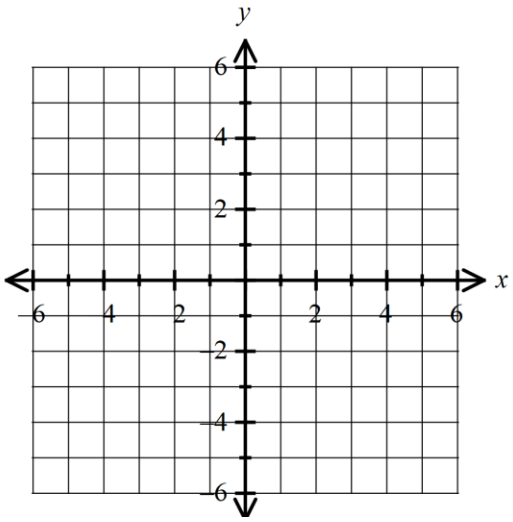
3.



Local Min	
Local Max	
Increasing	
Decreasing	
Positive	
Negative	
End Behavior	$f(x) \to$ _____ as $x \to -\infty$ and $f(x) \to$ _____ as $x \to \infty$

Sketch a graph of the following polynomial functions by using their local minima or maxima, describe the end behavior and the intervals in which the function is increasing or decreasing.

5. $f(x) = -x^4 + 5x - 4$



Local Min	
Local Max	
Increasing	
Decreasing	
Positive	
Negative	
End Behavior	$f(x) \to$ _____ as $x \to -\infty$ and $f(x) \to$ _____ as $x \to \infty$

x	–3	–2	–1	0	1	2	3
$f(x)$							

Day 4 – Add, Subtract, and Multiply Polynomials

Objectives: SWBAT Add, Subtract, and Multiply Polynomials

$x + x =$ _____ **vs** $x \cdot x =$ _____

Adding polynomials vertically and horizontally.

1. $(3x^3 - 2x^2 + 4x - 6) + (x^3 - 5x^2 + 3)$

2. $(2y^3 + 7y^2 - 6y) + (-4y^2 + 3y - 9)$

Subtracting polynomials vertically and horizontally.

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

4. $(8y^2 - 5y + 11) - (12y^2 - 9y - 3)$

Multiplying polynomials horizontally and the "Box" method

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

6. Box: $(x - 3)(x^2 + 2x - 5)$

Day 5 –Multiply Polynomials using Special Product Patterns

SPECIAL PRODUCT PATTERNS

******Shortcuts if you can remember them*******

Sum and Difference:

$(a+b)(a-b)=a^2-b^2$ Example: $(x+2)(x-2)=$ _____

Square of a Binomial:

$(a+b)^2=a^2+2ab+b^2$ Example: $(y+4)^2=$ _____

$(a-b)^2=a^2-2ab+b^2$ Example: $(3p^2-2)^2=$ _____

Cube of a Binomial:

$(a+b)^3=a^3+3a^2b+3ab^2+b^3$ Example: $(x+1)^3=$ _____

$(a-b)^3=a^3-3a^2b+3ab^2-b^3$ Example: $(r-3)^3=$ _____

Perform the following Polynomial Multiplication. If a rule can be use, stay which one, label your "a" and "b," and then use it.

11. $(6q-3r)^2$

12. $(2m+5)^3$

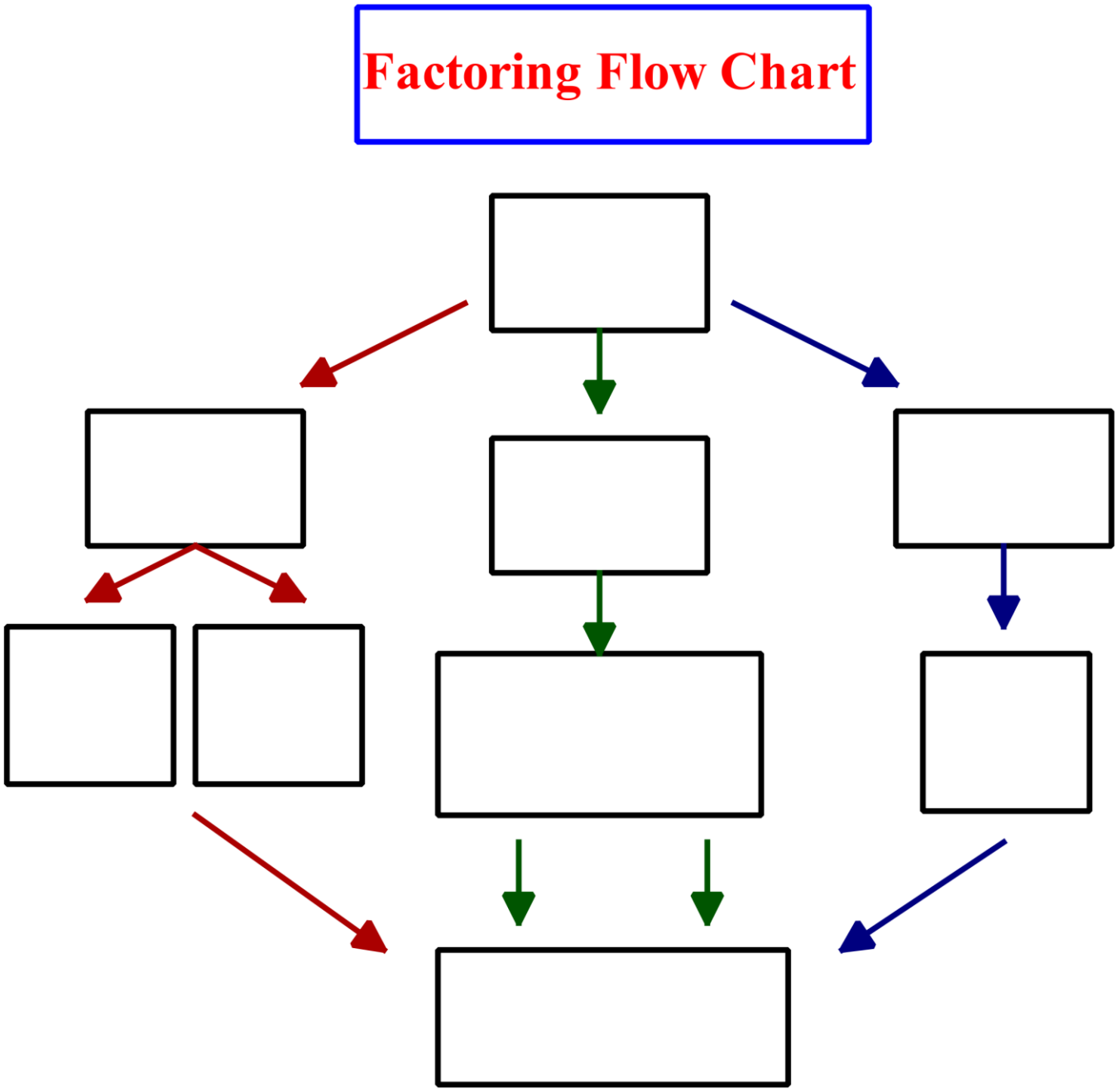
c. $(x+3)(x-6)(x+5)$

Day 6 – Factoring and Solving Polynomial Equations

Objectives: SWBAT Factor polynomials

Prime polynomial

Factored completely



Sum of two cubes:

$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$ Example: $x^3 + 8 =$ _____

Difference of two cubes:

$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$ Example: $8x^3 - 1 =$ _____

Factor the sum or difference of cubes.

1. $z^3 - 125$
2. $81y^4 + 192y$

a. $8x^3 + 64$

Factor by grouping.

4. $x^3 - 2x^2 - 9x + 18$

b. $x^3 + 2x^2 - 25x - 50$

Factor polynomials in quadratic form.

6. $3y^7 - 15y^5 + 18y^3$
7. $x^4 - 14x^2 + 45$

Solve a polynomial equation.

8. $x^4 + 9 = 10x^2$

c. $2x^5 + 24x = 14x^3$