***Polynomials***

What is a polynomial? Rather than use the textbook’s complicated definition, lets just look at some examples of polynomials:

6x2 y3 – 4 1/2w5 4t8 – 7t3

Notice the examples above don’t have any variables in the denominator (that means bottom of the fraction) or any variables in the exponent. They also don’t have absolute values of variables and all the variables have whole number exponents.

To clarify this let’s look at some examples of things that would NOT be a polynomial:

   n.85 – n

**Classifying Polynomials**

Before we can classify polynomials we have to get the polynomial into Standard Form. Standard Form is when you line up the terms of a polynomial from highest degree term to lowest degree term.

Which of the following polynomials is in Standard Form? (Yes or No)

 \_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_

(Answers: No, Yes, Yes)

Once the polynomial is in Standard Form there are two steps to naming it.

**First Step:** ***Degree***

The degree of a polynomial is the number of the highest exponent in the leading term of the polynomial.

|  |  |  |
| --- | --- | --- |
| **Name** | **Degree** | **Example** |
| Constant | 0 | -5 |
| Linear | 1 | y+4 |
| Quadratic | 2 | n2 + 3n +1 |
| Cubic | 3 | x3 + 4x2 - 8 |
| Quartic | 4 | z4 - 16 |

So for example if you had the polynomial, 3x3 + 6x2 – 7 , what would the degree of this polynomial be? Write your answer to the side.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Hopefully you wrote 3. If not raise your hand and ask for help!

**Second Step: *Number of Terms***

The second way to classify polynomials is by the number of terms they have.

|  |  |  |
| --- | --- | --- |
| **Name** | **Terms** | **Example** |
| Monomial | 1 | 8y2 |
| Binomial | 2 | m + 6 |
| Trinomial | 3 | 3z4 – z2 + 12 |
| Polynomial with… | 4,5,6,…. | 5p7 + 2p5 – 4p3 – p2 + … |

**Leading Coefficient**

Another thing I can ask you about polynomials is “what is the leading coefficient”. In order to answer this you must first put the polynomial in standard form (if it’s not already). Then all you have to do is tell me the number in front of the first term. Yes it’s that simple.

Example: 2x2 – 7x + 5x5 +3

What would the leading coefficient be? (*Hint:* First put into standard form.)

What does this equation look like in standard form? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

After you’ve done that what is the leading coefficient? \_\_\_\_\_\_\_\_\_\_\_\_\_

**Adding and Subtracting Polynomials**

Now that you know how to classify polynomials let’s get on to the fun stuff, adding and subtracting. Look at the following example.

(5x2 + 9 + 2x) + (11x3 + 4 + 2x2 – 2x)

Now in order to add these two things together we need to make sure we are adding like terms together. This means we need to add all the cubic terms together, all the quadratic terms together, etc.

To make this visually easy, line up each one vertically (one over the other). As you’re doing this step make sure you are writing out each polynomial in standard form! It should look like this when you’re done:

5x2 + 2x + 9

+ 11x3 + 2x2 – 2x + 4­

­­­

Notice how all of the like terms now line up with each other? This makes it really easy now for us to add the terms together. Go ahead and solve this. Show your work below.

You hopefully got 11x3 + 7x2 + 13. If you didn’t, raise your hand and get some help!

You’ll follow this same method for subtracting polynomials as well.

*Do problems:* pg 410 # 6-13 (all), 23-30 (choose 2 each section)

**Multiplying Polynomials**

Multiplying polynomials is also really easy as long as you know how to distribute. Now if you don’t know what distribute means than you’re really going to need to pay attention to this next part.

Say I ask you this question: Find the product of 4x(x2 + 3).

When I say distribute I mean that you have to distribute the 4x to x2 term and the 3 term. What that means is you have to multiply the 4x to BOTH terms.

Do this below and then check your answer against my key.

Now what if I gave you this problem: (x-4)(3+5x – x2).

This is where knowing how to distribute becomes very important! You need to make sure that you multiply both x and -4 against all 3 terms of the second polynomial.

Helpful Hint: Draw 3 arrows from the x to the 3 terms of the second polynomial. Then put another 3 arrows from the -4 to the 3 terms of the second polynomial. You should have 6 arrows in total. These represent the 6 different multiplications you will have to do.

Complete the problem below and be sure to show all of your work. When you’re done with the entire multiplying process make sure you put your answer in Standard Form. Then check your answer.

*Do Problems:* pg 418 # 1-8 (all), 18-25 (evens)