Classify each by the number of terms.

1. $7x^3 - 80x$

   Binomial

2. $-15x$

   Monomial

3. $5x^2 - 3x + 11$

   Trinomial

Classify each by its degree.

1. $9x - 5$

   Linear

2. $(x + 7)(x - 4)$

   Quadratic

3. $7x^3 - 18x$

   Cubic

4. -108

   Constant

Find the next two rows of Pascal's Triangle.

Each row starts and ends with a one. The other numbers are found by taking the sum of the two numbers above in the previous row.

1

1 1

1 2 1

1 3 3 1

1 4 6 4 1

1 5 10 10 5 1

1 6 15 20 15 6 1

1 7 21 35 35 21 7 1

Row 0 → 1

Row 1 → 1 1

Row 2 → 1 2 1

Row 3 → 1 3 3 1

1 4 6 4 1

1 5 10 10 5 1

1 6 15 20 15 6 1

1 7 21 35 35 21 7 1

Row 8 → 1 8 28 56 70 56 28 8 1

Work together to expand each.

1. $(a + b)^0 =$ 1

2. $(a + b)^1 =$ $1a + 1b$

3. $(a + b)^2 =$ $1a^2 + 2ab + 1b^2$

4. $(a + b)^3 =$ $1a^3 + 3a^2b + 3ab^2 + 1b^3$

Do you see a connection to Pascal's Triangle and the results of expanding powers of (a + b) ?

$(a+b)^0 = 1 \longrightarrow 1$

$(a+b)^1 = a+b \longrightarrow 1a + 1b$

$(a+b)^2 = a^2 + 2ab + b^2 \longrightarrow 1a^2 + 2ab + 1b^2$

$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3 \longrightarrow 1a^3 + 3a^2b + 3ab^2 + 1b^3$

The coefficients are the numbers from Pascal's Triangle. The row number corresponds to the exponent from the original problem.

Do you notice a pattern in the exponents?

$(a+b)^0 = 1$

$(a+b)^1 = a+b$

$(a+b)^2 = a^2 + 2ab + b^2$

$(a+b)^3 = a^3 b^0 + 3a^2b^1 + 3a^1b^2 + a^0b^3$

For the first variable the exponents decrease by one as you move across the page left to right.

For the second variable the exponents increase by one as you move across the page right to left.

Expand this: $(a + b)^4$

$1a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + 1b^4$

If you add up the exponents in each term they should have a sum of 4.

Do you notice a pattern with the signs?

$$(a-b)^7 = a^7 - 7a^6b + 21a^5b^2 - 35a^4b^3 + 35a^3b^4 - 21a^2b^5 + 7ab^6 - b^7$$

The signs alternate starting with a positive.

$$(a+b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$$

How would this expansion be different? $(a - b)^4$

$(a - b)^4 = (a + -b)^4 = a^4 + 4a^3(-b) + 6a^2(-b)^2 + 4a(-b)^3 + (-b)^4$

$a^4 - 4a^3b + 6a^2b^2 - 4ab^3 + b^4$

Expand each:

1. $(M + N)^5$

2. $(C - D)^6$

1. $(M + N)^5$

Use row 5 of Pascal's Triangle.

$1M^5 + 5M^4N^1 + 10M^3N^2 + 10M^2N^3 + 5MN^4 + 1N^5$

2. $(C - D)^6$ Use Row 6 of Pascal's Triangle.

$\underline{1C^6} - \underline{6C^5D} + \underline{15C^4D^2} - \underline{20C^3D^3} + \underline{15C^2D^4} - \underline{6CD^5} + \underline{1D^6}$