

Elementary algebra

Class notes

Polynomial Functions and Adding or Subtracting Polynomials (section 12.2)

We will use our "combining like terms" and function notation skills.

Factors versus terms:

terms: things we are adding (or subtracting)

expls: $\underline{x} + \underline{4}$ or $\underline{2x} + \underline{3}$ or $\underline{4x^2} + \underline{3x} - \underline{6}$

factors: things we are multiplying (or dividing)

expls: $\underline{5} \cdot \underline{x}$ or $\underline{3}(\underline{x+2})$ or $\underline{4} \cdot \underline{x^2}$

Could be thought of as $4 \cdot x \cdot x$ or $2 \cdot 2 \cdot x \cdot x$. What are the factors then?

Definition: Polynomial: A polynomial in x is [an expression that could be written as] a sum of terms of the form ax^n , where a is a real number and n is a whole number.

"poly" = many
"nomials" = terms

What are the whole numbers?

expls: $4x^2 + 3x + 8$

$-15x^6 - 8x + 7x^2 - 5x^9$

$5x + 7$

Can you pick out the ax^n terms?
13

counterexpls: $4x^{1/2} + 3x + 8$

$-15x^6 - 8x + 7x^2 - 5x^9$

$\frac{1}{5x+7}$

Why are these *not* polynomials?

Occasionally, you'll see polynomials in two variables like $5x^2y + 7xy - 7y$. We treat them mostly the same as the polynomials above.

Which of the following are polynomials? Identify what disqualifies the non-polynomials.

a.) $4x^3$

b.) $5x^4 + 4\sqrt{x}$

c.) $\frac{3+2x}{4x^2+5}$

d.) $10x^2 + 4x - 8$

e.) 6

f.) $14x^2 + 3x + 7$

Are all terms in the form ax^n ?

Find the values of a and n so that 6 could be written as ax^n .

How many terms do you think are in a...

monomial?

binomial?

trinomial?

These words will be used a lot. Know the difference. Write an example of each now.

Definition: Degree of a Term: the sum of the exponents on the term's variables

expl: $5x^2y^4$ has a degree of 6

$7x^3$ has a degree of 3

5 has a degree of 0

Why?

Definition: Degree of Polynomial: the greatest degree of any term in the polynomial

What is the degree of the following polynomials?

a.) $4x^2 + 5x - 9$

b.) $5x^2y^4 + 8xy - 3x^3y^4$

c.) $2x - 7 + 5x^2$

usually the plain number in front

Definition: Coefficient of a term: the numerical factor of a term

What is the coefficient of the following terms?

a.) $5x^2$

b.) 7

c.) $x^4 \cdot 6$

"function of x"

Functions

$f(x)$

"f of x"

A rule that tells you what to do to x.

Recall how function notation is used. Review it if needed.

expl 1: If $P(x) = x^2 + x + 1$ and $Q(x) = 5x^2 - 1$, find the following.

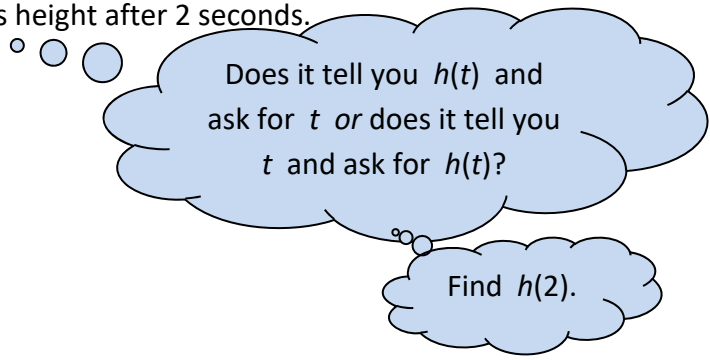
a.) $Q(4)$

Plug 4 into the formula for Q.

b.) $P(-4)$

Calculator note: Be sure to use parentheses when squaring a negative.

expl 2: A ball is thrown upward from the top of a building. Its height, in feet, $h(t)$ after t seconds is given by $h(t) = -16t^2 + 40t + 25$. Find its height after 2 seconds.



Adding or Subtracting Polynomials

expl 3: Simplify by combining like terms.

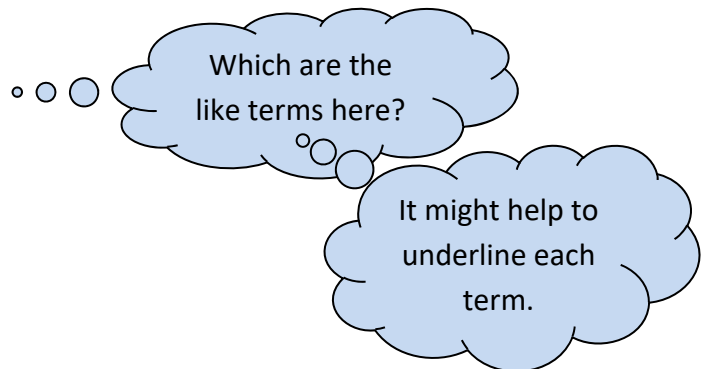
$$15x^2 - 3x^2 - y$$

expl 4: Simplify by combining like terms.

$$\frac{2}{5}x^2 - \frac{1}{3}x^3 + x^2 - \frac{1}{4}x^3 + 6$$

expl 5: Simplify by combining like terms.

$$x^2y + xy - y + 10x^2y - 2y + xy$$

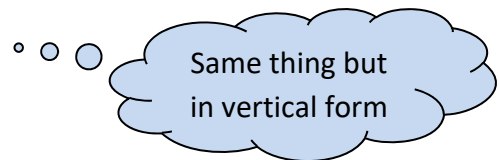


expl 6: Perform the indicated operation.

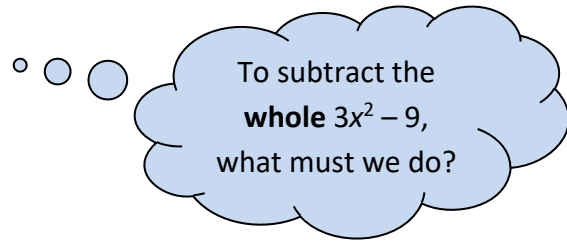
$$(3x - 8) + (4x^2 - 3x + 3)$$

expl 7: Perform the indicated operation.

$$\begin{array}{r} 3t^2 + 4 \\ + 5t^2 - 8 \\ \hline \end{array}$$

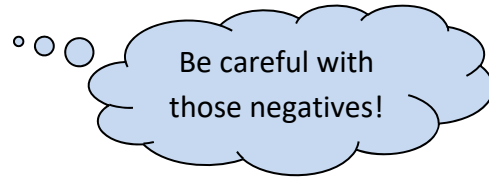


expl 8: Perform the indicated operation.
 $(2x^2 + 5) - (3x^2 - 9)$

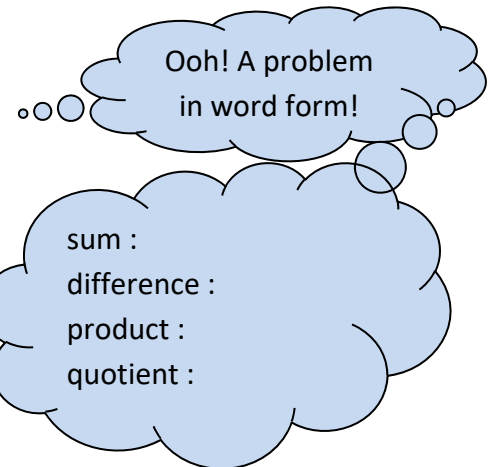


expl 9: Perform the indicated operation.

$$\begin{array}{r} 5x^3 - 4x^2 + 6x - 2 \\ - (3x^3 - 2x^2 - x - 4) \\ \hline \end{array}$$



expl 10: Subtract $(-12x - 3)$ from the sum of $(-5x - 7)$ and $(12x + 3)$



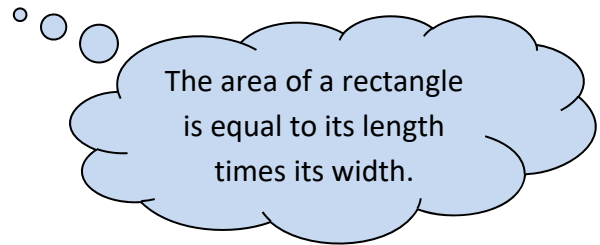
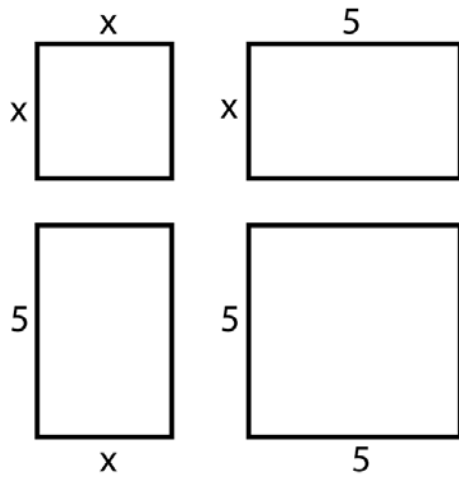
expl 11: Perform the indicated operation.

$$(3x^2 + 5x - 8) + (5x^2 + 9x + 12) - (x^2 - 14)$$

expl 12: Perform the indicated operation.

$$(a^2 - ab + 4b^2) + (6a^2 + 8ab - b^2)$$

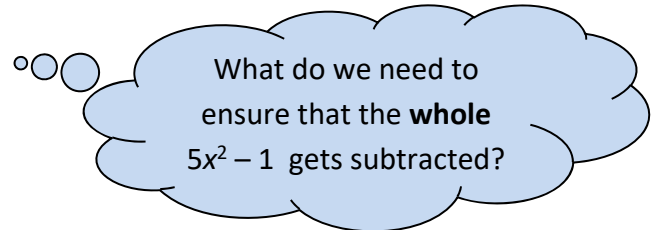
expl 13: Find the area of each figure. Then add them to find an expression for the total area. As always, simplify if needed.



expl 14: If $P(x) = x^2 + x + 1$ and $Q(x) = 5x^2 - 1$, find the following.

a.) $P(x) + Q(x)$

b.) $P(x) - Q(x)$



expl 15: If $P(x) = 3x + 1$, find the following.

a.) $P(2)$

b.) $P(a)$

c.) $P(-x)$

d.) $P(x + h)$

