

5.2 - Multiplying Polynomials

Note Title

Rules you should already know.

If not, memorize them!

More practice in 1.4

Definitions and Properties of Exponents

The following summary assumes that no denominators are 0 and that 0^0 is not considered. For any integers m and n ,

1 as an exponent: $a^1 = a$

0 as an exponent: $a^0 = 1$

Negative exponents: $a^{-n} = \frac{1}{a^n}$

$$\frac{a^{-n}}{b^{-m}} = \frac{b^m}{a^n}$$

$$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$$

The Product Rule: $a^m \cdot a^n = a^{m+n}$

The Quotient Rule: $\frac{a^m}{a^n} = a^{m-n}$

The Power Rule: $(a^m)^n = a^{mn}$

Raising a product to a power: $(ab)^n = a^n b^n$

Raising a quotient to a power: $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$

① Multiply and simplify.

a) $(3x^3y^8)(-2x^4y^5)$

b) $(-3a^2b^3c^4)(-7a^3b^7c^{11})$

(using distribution)

c) $3x(4x-7)$

d) $4rs^2(r^2-2s^2)$

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

(Double Distribute)

$$f) (r + 3)(r^2 - 5r + 2)$$

The Product of Two Polynomials

The *product* of two polynomials $P(x)$ and $Q(x)$ is found by multiplying each term of $P(x)$ by every term of $Q(x)$ and then combining like terms.

② Multiply (vertical helps)

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

F
O
I
L

$$(A+B)(C+D)=$$

③ Multiply

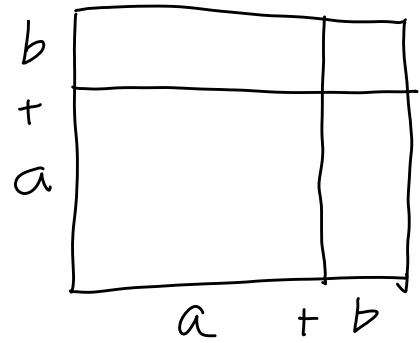
a) $(x+4)(x-3)$

b) $(3x-4y)(x-2y)$

c) $(r-2)(r+3)(r-4)$

Does $(x+3)^2 = x^2+9$? Discuss, figure out.

Shortcut for $(A+B)^2$



Squaring a Binomial

$$(A + B)^2 = A^2 + 2AB + B^2;$$

$$(A - B)^2 = A^2 - 2AB + B^2$$

The square of a binomial is the square of the first term, plus twice the product of the two terms, plus the square of the last term.

Trinomials that can be written in the form $A^2 + 2AB + B^2$ or $A^2 - 2AB + B^2$ are called *perfect-square trinomials*.

④ Multiply
a) $(x - 3)^2$

b) $(4x + 3y)^2$

c) $(5y^3 - \frac{1}{2}z)^2$

Discover the pattern of

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

$$(x+4)(x-4)$$

The Product of a Sum and a Difference

$$(A + B)(A - B) = A^2 - B^2$$

This is called a *difference of two squares*.

The product of the sum and the difference of the same two terms is the square of the first term minus the square of the second term.

⑤ Multiply

a) $(r-7)(r+7)$

b) $(3xy + 2z^2)(3xy - 2z^2)$

c) $(\frac{2}{3}n - m^3)(\frac{2}{3}n + m^3)$

⑥ Multiply

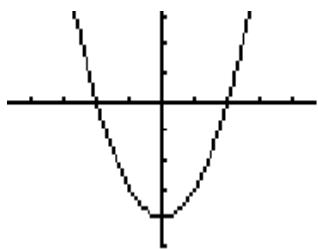
a) $(3x + 5y)(-3x + 5y)$

b) $(2t - 3)^2 - (t + 2)(t - 2)$

Functions

We've shown $(x - 2)(x + 2) = x^2 - 4$

observe the graph of $f(x) = x^2 - 4$



⑦ Given $f(x) = x^2 - 3x + 2$, Find

a) $f(a) + 3$

b) $f(a + 3)$

c) $f(a + h) - f(a)$

note: $a \neq b$