5.3 Multiplying Polynomials

→ Multiplying polynomials is just a careful application of the distributive law.

Ex $(3x-1)(4x) = (3x)(4x) - 1(4x)$

$= 12x^2 - 4x$

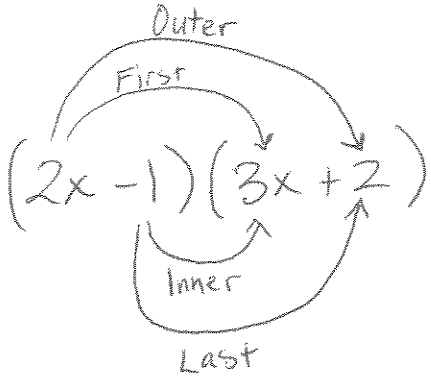
(binomial → monomial)

Ex $5x^2(3x^2 - 2x + 1) = (5x^2)(3x^2) - (5x^2)(2x) + (5x^2)(1)$

$= 15x^4 - 10x^3 + 5x^2$

→ Multiplying monomials is easy. what about two binomials?

FOIL



Ex $(2x-1)(3x+2)$

First Outer Inner Last

$= 2x \cdot 3x + 2x \cdot 2 - 1 \cdot 3x - 1 \cdot 2$

$= 6x^2 + 4x - 3x - 2$

$= 6x^2 + x - 2$

→ trinomial

Ex $(4x+7)(3x-7)$

First Outer Inner Last

$= 12x^2 - 28x + 21x - 49$

$= 12x^2 - 7x - 49$

→ what about a binomial and a trinomial?

Ex $(2x+1)(x^2-3x-2) = 2x^3-6x^2-4x+x^2-3x-2$

$= 2x^3-5x^2-7x-2$

→ The next three examples represent important forms you should recognize

Ex $(2x-3)(2x+3) = 4x^2+6x-6x-9$

$= 4x^2-9$ → both perfect squares

Ex $(x+2)^2 = (x+2)(x+2) = x^2+2x+2x+4$

$= x^2+4x+4$

1st term squared: x^2; 2 · 1st term · 2nd term: $4x$; 2nd term squared: 4

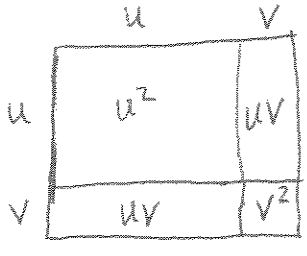
Ex $(2x-3)^2 = (2x-3)(2x-3) = 4x^2-6x-6x+9$

$= 4x^2-12x+9$

1st term squared: $4x^2$; 2 · 1st term · 2nd term: $-12x$; 2nd term squared: 9

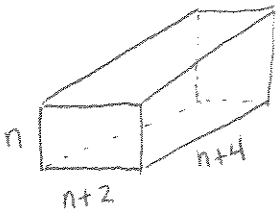
→ know these!

1) $(u+v)(u-v) = u^2-v^2$
2) $(u+v)^2 = u^2+2uv+v^2$
3) $(u-v)^2 = u^2-2uv+v^2$



→ you can think of finding an area

Ex You are out sailing and get caught by pirates. They put you in a torture box.
The torture box has sides of length n, $n+2$, and $n+4$.
What is the volume of the box?

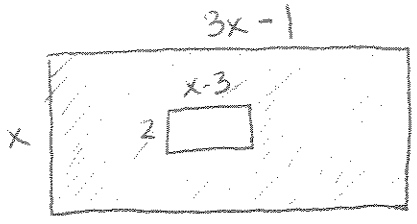


$$V(n) = n(n+2)(n+4)$$
$$= (n^2+2n)(n+4)$$
$$= n^3 + 4n^2 + 2n^2 + 8n$$
$$= n^3 + 6n^2 + 8n$$

If $n = 2$ feet, what is the volume?

$$V(2) = 2^3 + 6(2)^2 + 8(2) = 8 + 24 + 16 = 48 \text{ feet}^3$$

Ex Find the area of the shaded region



$$A(x) = x(3x-1) - 2(x-3)$$
$$= 3x^2 - x - 2x + 6$$
$$A(x) = 3x^2 - 3x + 6$$

Supplementary Problems: pp. 323-326

1, 3, 5, 11, 13, 15, 17, 27, 29, 31, 33, 35, 37, 43, 53, 55, 69, 71, 73, 75, 101, 103, 105,