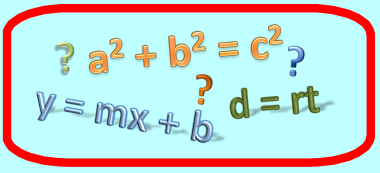
Math 115

Spring 2018

Lecture 20



Ch. 5 Factoring Polynomials

writing the polynomial as a product of other polynomials.

$6 = 2 \cdot 3$

$75 = 3 \cdot 25$
$= 3 \cdot 5 \cdot 5$

$100 = 2 \cdot 50$
$= 2 \cdot 2 \cdot 25$
$= 2 \cdot 2 \cdot 5 \cdot 5 = 2^2 \cdot 5^2$

} Prime factorization

$10x - 15 = 2 \cdot 5x - 3 \cdot 5$ Reverse of distribution

$= 5(2x - 3)$

GCF

Greatest Common Factor

$20x^2 + 16x = 2 \cdot 2 \cdot 5 \cdot x \cdot x + 2 \cdot 2 \cdot 2 \cdot 2 \cdot x$

$= 2 \cdot 2 \cdot x(5 \cdot x + 2 \cdot 2)$

$= 4x(5x + 4)$

GCF

Factor out the GCF:

$24x^2y - 16xy^2$

$= 8 \cdot 3 \cdot x \cdot x \cdot y - 8 \cdot 2 \cdot x \cdot y \cdot y$

$= 8xy(3x - 2y)$

GCF

$30x^3 - 20x^2 + 5x$

$= 5x \cdot 6x^2 - 5x \cdot 4x + 5x \cdot 1$

GCF

$= 5x(6x^2 - 4x + 1)$

When working with 4 terms or more, we can try grouping

$x^3 + 5x^2 + 3x + 15$

$= x^2(x+5) + 3(x+5)$

$= (x+5)(x^2+3)$

$2x^3 - 7x^2 + 10x - 35$

$= x^2(2x-7) + 5(2x-7)$

$= (2x-7)(x^2+5)$

$3x^3 + 7x^2 - 15x - 35$

$= x^2(3x+7) - 5(3x+7)$

$= (3x+7)(x^2-5)$

$x^3 - 4x^2 - 4x + 16$

$= x^2(x-4) - 4(x-4)$

$= (x-4)(x^2-4)$ can be factored more, later

Factor Completely:

① $12x - 7$ = Prime Expression

② $12x^2 - 14x = \boxed{2x(6x - 7)}$ (GCF)

③ $5x(2x-3) - 8(2x-3) = \boxed{(2x-3)(5x-8)}$

④ $3x^2 + 9xy - 3y^2 - xy$

$= 3x(x+3y) - y(x+3y) = \boxed{(x+3y)(3x-y)}$

④ $6x^2y^2 - 3xy = \boxed{3xy(2xy-1)}$

⑤ $3x^2(2x+3) - 10x(2x+3) - 2(2x+3)$

$= (2x+3)(3x^2 - 10x - 2)$

⑥ $5x^3 - 8x^2 - 10x + 16$

$= x^2(5x-8) - 2(5x-8)$

$= (5x-8)(x^2-2)$

$A = 2x^2 + 11x - 6$ $W = 2x - 1$

$L = ?$ $L = x + 6$

$A = LW$

$2x^2 + 11x - 6 = (\ ?\ )(2x - 1)$

$= (x + 6)(2x - 1)$

Foil to Verify

$A = LW \rightarrow \frac{A}{W} = L$

$2x \boxed{x} = 2x^2$

$2x \boxed{6} = 12x$

$x + 6$

$2x - 1 \overline{)\ 2x^2 + 11x - 6}$

$-(2x^2 - x\ \ \ \ )$

$12x - 6$

$-(12x - 6)$

0

$A = 18x^2 - 9x - 20$ $W = ?$

$L = 6x + 5$

$A = LW$

$18x^2 - 9x - 20 = (6x + 5)(3x - 4)$

W

Foil to Verify

$A = LW$

$\frac{A}{L} = W$

$6x \boxed{3x} = 18x^2$

$6x \boxed{-4} = -24x$

$3x - 4$

$6x + 5 \overline{)\ 18x^2 - 9x - 20}$

$-(18x^2 + 15x\ \ \ \ )$

$-24x - 20$

$-(-24x - 20)$

0

Factoring Trinomials:

① Take care of GCF

② Make sure it is written in descending order.

$2x^2 + 7x + 5$

10

$P = 10$: $1, 10$

$S = 7$: $2, 5$

$= 2x^2 + 2x + 5x + 5$

$= 2x(x+1) + 5(x+1)$

$= (x+1)(2x+5)$

$3x^2 + 10 + 13x$

$= 3x^2 + 13x + 10$

30

$P = 30$: $1, 30$

$2, 15$

$3, 10$

$5, 6$

$S = 13$

$= 3x^2 + 3x + 10x + 10$

$= 3x(x+1) + 10(x+1)$

$= (x+1)(3x+10)$

Factor Completely

$6x^2 - 25x + 4$

$P = 24$

$S = -25$

24

$-1, -24$

$-2, -12$

$-3, -8$

$-4, -6$

$= 6x^2 - x - 24x + 4$

$= x(6x-1) - 4(6x-1)$

$= (6x-1)(x-4)$

Factor Completely

$5x - 12 + 2x^2$

$= 2x^2 + 5x - 12$

$= 2x^2 - 3x + 8x - 12$

$P = -24$

$S = 5$

-24

$-1, 24$

$-2, 12$

$-3, 8$

$-4, 6$

$= x(2x-3) + 4(2x-3)$

$= (2x-3)(x+4)$

$9x^2 + 100 + 60x$

$= 9x^2 + 60x + 100$

$= 9x^2 + 30x + 30x + 100$

$P = 900$

$S = 60$

900

1,900

2,450

3,300

⋮

30,30

$= 3x(3x+10) + 10(3x+10)$

$= (3x+10)(3x+10)$

$= (3x+10)^2$

Factor comp.

$4x^2 - 10x + 25$

$P = 100$

$S = -10$

100

$-1, -100$

$-2, -50$

$-4, -25$

$-5, -20$

$-10, -10$

Prime

$20x^2 - 7x - 6$

$P = -120 \quad -120$

$S = -7$

1, -120
2, -60
3, -40
4, -30
5, -24
6, -20
8, -15

$= 20x^2 + 8x - 15x - 6$

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

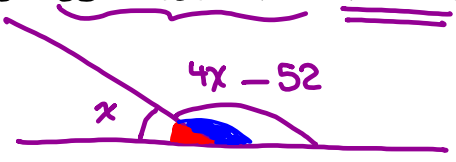
$= (5x+2)(4x-3)$

FOIL To Verify

Two angles are Supplementary.

one of them is 52° less than 4 times the other one.

Find both angles.



$x + 4x - 52 = 180$

$5x = 180 + 52$

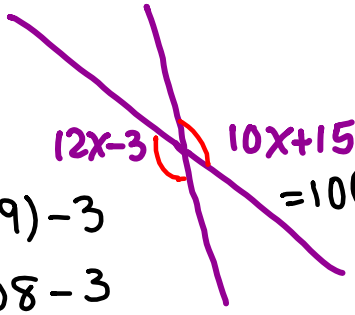
$5x = 232$

$x = \frac{232}{5} \qquad x = 46.4$

46.4° & $180 - 46.4 = 133.6^\circ$

46.4° & 133.6°

Find all angles below



Vertical Angles are equal.

$12x - 3 = 10x + 15$

$12x - 10x = 15 + 3$

$2x = 18$

$x = 9$

$= 12(9) - 3$

$= 108 - 3$

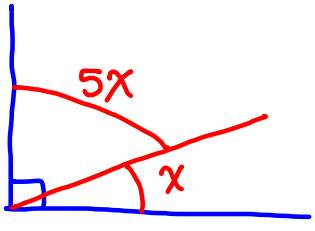
$= \boxed{105^\circ}$

$= 10(9) + 15$

$= 90 + 15$

$= \boxed{105^\circ}$

Find two complementary angles Such that one of them is 5 times the other one.



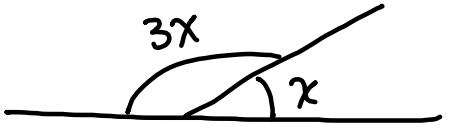
$x + 5x = 90$

$6x = 90$

$x = \frac{90}{6}$ $x = 15$

15° & 75°

Find two supplementary angles such that one of them is 3 times the other one.

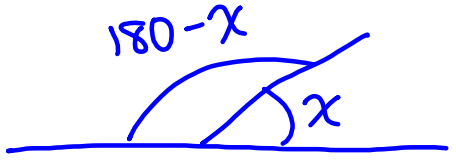


$x + 3x = 180$

$4x = 180$

$x = 45$

45° & 135°



$x = 3(180 - x)$

$x = 540 - 3x$

$x + 3x = 540$

$4x = 540$

$x = 135$

135° & 45°

Find an angle such that the sum of its Complement and its Supplement is 160°.

Angle	Comp.	Suppl.
x	$90 - x$	$180 - x$

Comp. + Suppl. $= 160$

$90 - x + 180 - x = 160$

$270 - 2x = 160$

$-2x = 160 - 270$

$-2x = -110$

$x = 55$

55°

Find an angle whose Supplement is 38° less than 3 times its Complement.

Angle	Supp.	Comp.
x	$180-x$	$90-x$

Suppl. $= 3 \cdot$ Comp. $- 38$

$180-x = 3(90-x) - 38$

$180-x = 270 - 3x - 38$

$180-x = 232-3x$

$-x+3x = 232-180$

$2x = 52$

$x = 26$

$26°$