a_1, a_2 such that $a_1 + a_2 = b$, $a_1 a_2 = c$

Math-I 110 5.4 Notes

Factoring Trinomials of the Type x2 + bx + c

$x^2 + bx + c$ — middle term (split this term)

Factors 1-140 →

$a^2 + a - 2$ $= a^2 + 2a - a - 2$ $= a(a+2) - 1(a+2) = (a+2)(a-1)$	$p^3 - p^2 - 72p$ $= p(p^2 - p - 72)$ $= p[p^2 - 9p + 8p - 72]$ $= p[p(p-9) + 8(p-9)] = p(p-9)(p+8)$ $a_1 + a_2 = -1$, $a_1 a_2 = -72 = -9 \cdot 8$
$a^2 - 11a + 28$ $= a^2 - 4a - 7a + 28$ $= a(a-4) - 7(a-4) = (a-4)(a-7)$ $a_1 + a_2 = -11$, $a_1 a_2 = 28$ $-4, -7$	$t^2 - 14t + 45$ $= (t-9)(t-5)$ $a_1 + a_2 = -14$, $a_1 a_2 = 45 = -9 \cdot -5$
$x^2 + 3x - 10 = 3x + x^2 - 10$ $= x^2 + 5x - 2x - 10$ $= x(x+5) - 2(x+5) = (x+5)(x-2)$ $a_1 + a_2 = 3$, $a_1 a_2 = -10 = -2 \cdot 5$	$x^2 + x - 6 = x + x^2 - 6$ $= (x-2)(x+3)$ $a_1 + a_2 = 1$, $a_1 a_2 = -6 = -2 \cdot 3$
$x^2 - 3x + 5$ $5 = 1 \times 5 \to 6$ $= -1 \cdot (-5) \to -6$ $a_1 + a_2 = -3$, $a_1 a_2 = 5$ ⇒ Cannot be factorized any further	$x^2 + 12x + 13$ $1 \cdot 13$ or $(-1)(-13)$ Sum = 14 or Sum = −14 $a_1 + a_2 = 12$, $a_1 a_2 = 13$ ⇒ Cannot be factorized any further

Factoring Trinomials of the Type x2 + bx + c, finding GCF first.

$2x^2 + 6x - 108$ $= 2(x^2 + 3x - 54)$ $= 2(x+9)(x-6)$ $a_1 + a_2 = 3$, $a_1 a_2 = -54 = 9(-6)$	$3p^2 - 9p - 120$ $= 3(p^2 - 3p - 40)$ $= 3(p-8)(p+5)$ $a_1 + a_2 = -3$, $a_1 a_2 = -40 = -8(5)$
$x^3 + 2x^2 - 63x$ $= x(x^2 + 2x - 63)$ $= x(x-7)(x+9)$ $a_1 + a_2 = 2$, $a_1 a_2 = -63 = -7 \cdot 9$	$5y^2 + 40y + 35$ $= 5(y^2 + 8y + 7)$ $= 5(y+1)(y+7)$ $a_1 + a_2 = 8$, $a_1 a_2 = 7 = (1)(7)$
$3x^2 + 15x + 18$ $= 3(x^2 + 5x + 6)$ $= 3(x+2)(x+3)$ $a_1 + a_2 = 5$, $a_1 a_2 = 6 = 2 \cdot 3$	$56x + x^2 - x^3$ $= -x(-56 - x + x^2)$ $= -x(x^2 - x - 56)$ $= -x(x-8)(x+7)$ $a_1 + a_2 = -1$, $a_1 a_2 = -56 = -8 \cdot 7$

$-63 \to -1 \times 63$ or $1 \times (-63)$

-3×21 or $3(-21)$

-7×9 or $7(-9)$

$y^4 + 5y^3 - 84y^2$

$a_1+a_2=5$, $a_1a_2=-84$

$= 12(-7)$

$= y^2(y^2+5y-84)$

$= y^2(y+12)(y-7)$

$x^4 + 11x^3 - 80x^2$

$a_1+a_2=11$, $a_1a_2=-80$

$= -5(16)$

$= x^2(x^2+11x-80)$

$= x^2(x-5)(x+16)$

$3x^2 - 4x - 4$

$a_1+a_2=-4$, $a_1a_2=-12$

$= -6(2)$

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

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

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

$2x^2 - x - 10$

$a_1+a_2=-1$, $a_1a_2=-20$

$= -5(4)$

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

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

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

$6t^2 + t - 15$

$a_1+a_2=1$, $a_1a_2=-90$

$= -9(10)$

$= 6t^2-9t+10t-15$

$= 3t(2t-3)+5(2t-3)$

$= (2t-3)(3t+5)$

$10y^2 + 7y - 12$

$a_1+a_2=7$, $a_1a_2=-120$

$= -8(15)$

$= 10y^2-8y+15y-12$

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

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

$6p^2 - 20p + 16$

$a_1+a_2=-20$, $a_1a_2=96$

$= -8(-12)$

$= 6p^2-8p-12p+16$

$= 2p(3p-4)-4(3p-4)$

$= (3p-4)(2p-4)$

$24a^2 + 14a + 2$

$a_1+a_2=14$, $a_1a_2=48$

$= 6(8)$

$= 24a^2+6a+8a+2$

$= 6a(4a+1)+2(4a+1)$

$= (6a+2)(4a+1)$ favor 2

$= 2(3a+1)(4a+1)$

$9a^2 + 18a + 8$

$a_1+a_2=18$, $a_1a_2=72$

$= 6(12)$

$= 9a^2+6a+12a+8$

$= 3a(3a+2)+4(3a+2)$

$= (3a+2)(3a+4)$

$8y^2 + 30y^3 - 6y$

$= 2y(4y+15y^2-3)$

$= 2y(15y^2+4y-3)$

$a_1+a_2=4$, $a_1a_2=-45$

$= -5 \cdot 9$

$= 2y[15y^2-5y+9y-3]$

$= 2y[5y(3y-1)+3(3y-1)]$

$= 2y(3y-1)(5y+3)$

$4t^2 + 10t^3 - 6t$

$= 2t(2t+5t^2-3)$

$= 2t(5t^2+2t-3)$

$a_1+a_2=2$, $a_1a_2=-15$

$= 5(-3)$

$= 2t[5t^2+5t-3t-3]$

$= 2t[5t(t+1)-3(t+1)]$

$= 2t(t+1)(5t-3)$

$18x^2 - 24 - 6x$	$8x^2 - 16 - 28x$	$70x^4 - 68x^3 + 16x^2$
$= 6(3x^2 - x - 4)$	$= 4(2x^2 - 7x - 4)$	$= 2x^2(35x^2 - 34x + 8)$
$a_1 + a_2 = -1$, $a_1 a_2 = -12$	$a_1 + a_2 = -7$, $a_1 a_2 = -8$	$a_1 + a_2 = -34$, $a_1 a_2 = 280$
$= -1 \cdot 12$	$= -8 \cdot 1$	$280 \rightarrow -1 \times -280$
$= -2 \cdot 6$	$= 4[2x^2 - 8x + x - 4]$	-2×-140
$= -3 \cdot 4$	$= 4[2x(x-4) + 1(x-4)]$	-4×-70
$= -4 \cdot 3$	$= 4(x-4)(2x+1)$	-5×-56
$= -6 \cdot 2$		-7×-40
$= -12 \cdot 1$		-8×-35
$= 6[3x^2 - 4x + 3x - 4]$		-10×-28
$= 6[x(3x-4) + 1(3x-4)]$		-14×-20
$= 6(3x-4)(x+1)$		$-14 + (-20) = -34$
		$= 2x^2[35x^2 - 14x - 20x + 8]$
		$= 2x^2[7x(5x-2) - 4(5x-2)]$
		$= 2x^2(5x-2)(7x-4)$