

0.6 Factoring

If all the terms of a polynomial has a common factor, then it can be factored out.

Example: ① $2x^5 + 2x + 2 = 2(x^5 + x + 1)$

② $yx^5 + 2xy^2 + 2y = y(x^5 + 2xy + 2)$

③ $-3x^7 + 6x^2 = 3x^2(-x^5 + 2)$

* Factoring Trinomials

We can use the formula $(x+a)(x+b) = x^2 + (a+b)x + ab$

Example: ① $x^2 - 7x + 6 = (x - 1)(x - 6)$

✓ للتحقق من صحة الحل فنجرب:
 $-1 \times -6 = +6$
 $-1 + -6 = -7$

② $y^2 - 10y + 25 = (y - 5)(y - 5)$

check:- $-5 \times -5 = +25$
 $-5 + -5 = -10$ ✓

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

check:- $+2 \times -4 = -8$ ✓
 $+2 + -4 = -2$

* Special Factorizations

① Perfect square trinomials:

$$X^2 + 2aX + a^2 = (X+a)(X+a) = (X+a)^2$$

$$X^2 - 2aX + a^2 = (X-a)(X-a) = (X-a)^2$$

Example: ① $X^2 + 6X + 9 = (X+3)(X+3) = (X+3)^2$

② $X^2 - 6X + 9 = (X-3)(X-3) = (X-3)^2$

② Difference of two squares:

$$X^2 - a^2 = (X-a)(X+a)$$

Example: ① $X^2 - 16 = X^2 - (4)^2 = (X+4)(X-4)$

② $25X^2 - 36y^2 = (5X)^2 - (6y)^2 = (5X+6y)(5X-6y)$

③ Difference of two cubes:

$$X^3 - a^3 = (X-a)(X^2 + aX + a^2)$$

Example: ① $X^3 - 64 = X^3 - (4)^3 = (X-4)(X^2 + 4X + 16)$

② $27 - 8X^3 = (3)^3 - (2X)^3 = (3-2X)(9 + 6X + 4X^2)$

④ Sum of two cubes:

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

Example:- ① $x^3 + 64 = x^3 + (4)^3$
 $= (x+4)(x^2 - 4x + 16)$

② $27 + 8x^3 = (3)^3 + (2x)^3$
 $= (3 + 2x)(9 - 6x + 4x^2)$