

Factorisation Harder

Patrons are reminded that they must always factorise out the *lowest* power of any common factors. So given $a^6 - 4a^5$, factorise out the a^5 to get $a^5(a - 4)$.

Also, when you see something like

$$8x^3(x - 1)^6 - 4x^2(x - 1)^7$$

notice that the brackets are the same, so you can think about it as

$$8x^3k^6 - 4x^2k^7.$$

So we factorise out the 4, the x^2 , and the k^6 (which is $(x - 1)^6$). So

$$\begin{aligned} & 8x^3(x - 1)^6 - 4x^2(x - 1)^7, \\ & = 4x^2(x - 1)^6 [2x - (x - 1)], \\ & = 4x^2(x - 1)^6(x + 1). \end{aligned}$$

[Beylin, notice the equals signs are lined up.]

Factorise fully the following:

1. $x(x + 1) + 2(x + 1)$.

$$(x + 1)(x + 2)$$

2. $2x(x - 1) - 3(x - 1)$.

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

3. $x(x + y) + y(x + y)$.

$$(x + y)^2$$

4. $p(p - 2q) + q(p - 2q)$.

$$(p - 2q)(p + q)$$

5. $4x(x - 3) + 8(x - 3)$.

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

6. $x^5(x - 5) - x^4(x - 5)$.

$$x^4(x - 5)(x - 1)$$

7. $7x^2(x + 1)^5 + 14x(x + 1)^6$.

$$7x(3x + 2)(x + 1)^5$$

8. $27x^8(x - 1)^8 - 9x^9(x - 1)^7$.

$$9x^8(2x - 3)(x - 1)^7$$

9. $2x^4(x - 1)^4 + 8x^3(x - 1)^3$.

$$2x^3(x - 1)^3(x^2 - x + 4)$$

10. $(2x - 1)^7(2x + 3)^4 - (2x - 1)^8(2x + 3)^3$.

$$4(2x - 1)^7(2x + 3)^3$$

11. $10(t + 2)^6(t + 3)^4 - 5(t + 2)^7(t + 3)^3$.

$$5(t + 4)(t + 2)^6(t + 3)^3$$

12. $7x^3(x - 1)^8(2x + 1)^3 - 14x(x - 1)^9(2x + 1)^2$.

$$7x(2x + 1)^2(x - 1)^8(2x^3 + x^2 - 2x + 2)$$

13. $27(2t - 1)^2(t + 1)^2 - 18(2t - 1)(t + 1)^3$.

$$9(2t - 1)(4t - 5)(t + 1)^2$$

14. $y^4(y + 7)^4(2y - 1)^2 - 2y^2(y + 7)^3(2y - 1)$.

$$y^2(2y - 1)(y + 7)^3(2y^4 + 13y^3 - 7y^2 - 2)$$

15. $6(2z + 5)^7(z - 1)^{10} - 12(2z + 5)^6(z - 1)^{11}$.

$$42(z - 1)^{10}(2z + 5)^6$$