

Harder Factorising & Simplifying

Patrons are reminded that you should always pull out the *lowest* powers from an expression. For example

$$\begin{aligned}2x^3\sqrt{x-1} - \frac{4x^4}{\sqrt{x-1}} &= 2x^3(x-1)^{\frac{1}{2}} - 4x^4(x-1)^{-\frac{1}{2}} \\ &= 2x^3(x-1)^{-\frac{1}{2}}[(x-1) - 2x] \\ &= 2x^3(x-1)^{-\frac{1}{2}}(-x-1) \\ &= -2x^3(x-1)^{-\frac{1}{2}}(x+1) \\ &= -\frac{2x^3(x+1)}{\sqrt{x-1}}.\end{aligned}$$

Now factorise the following expressions fully.

1. $25x^2(2x+1) - 15x(2x+1)^2$.
2. $4x^2(x-3)^2 - 8x(x-3)$.
3. $10x^3(2x-1) + 5x^2(2x-1)^2$.
4. $y(y-4)^{10} - 2y^2(y-4)^9$.
5. $(x+1)^4(x+3) - 2(x+1)^3(x+3)^2$.
6. $9a(x+1)^4(x-2)^5 - 15a(x+1)^5(x-2)^4$.
7. $\frac{6(x+1)^3}{(2x+1)^5} - \frac{4(x+1)^4}{(2x+1)^6}$.
8. $(x+1)\sqrt{x+1} - 2\sqrt{x+1}$.
9. $\frac{(x+1)^2}{\sqrt{x-1}} - (x+1)\sqrt{x-1}$.
10. $\frac{10\sqrt{3x+1}}{(2x-1)^4} - \frac{20}{(2x-1)^3\sqrt{3x+1}}$.
11. $\frac{(x+1)^n}{(x-1)^m} + \frac{(x+1)^{n+1}}{(x-1)^{m+1}}$.
12. $ax^3(x+1)^7(x+2)^8 - a^2x^2(x+1)^7(x+2)^7$.
13. $\frac{2x+1}{\sqrt{x-1}} - (2x+1)^3\sqrt{x-1}$.
14. $2k(x-2)^4(2x+1)^{\frac{4}{3}} - k\sqrt[3]{2x+1}(x-2)^5$.