Loughborough University

Week 2: Algebra Basics

Solutions

1. When $x = -1, 2x^3 = 2 \times (-1)^3 = 2 \times -1 = -2$
2. $2x^3 + x^3 + x^4 + x^2 \times x + \frac{x^2}{x^6} - \left(x^2\right)^3 = 3x^3 + x^4 + x^3 + x^{-4} - x^6 = 4x^3 + x^4 + x^{-4} - x^6$
3. (a) Subtract to get $2x$, (b) Multiply to get $-8x^2$, (c) Multiplt to get $8x^2$, (d) Multiply to get $-8x^2$, (e) Subtract to get $-6x$, (f) Multiply to get $8x^2$.
4. In the first expression we are multiplying the result of $(x + 2)$ by the result of $(x + 3)$. In the second expression $(x + 2)$ is only multiplied by 3.
   $(x + 3)(x + 2) = x^2 + 5x + 6$ whereas $x + 3(x + 2) = 4x + 6$
5. Powers of x of at least order 2 appear in each term so x^2 is a factor. y does not appear in the first term so is NOT a factor.
   $4x^2 + 3yx^3 + 5yx^4 = x^2\left(4 + 3yx + 5yx^2\right)$
6. (a) $6x^2 + 7x - 5 = (2x - 1)(3x + 5)$ and (b) $4x^2 - 9 = (2x + 3)(2x - 3)$
7. (a) $\frac{abc}{3ac} = \frac{b}{3}$ and (b) $\frac{3ab}{a+b}$ cannot be simplified further.
8. $\frac{x^2+2x-15}{2x^2-5x-3} = \frac{(x+5)(x-3)}{(2x+1)(x-3)} = \frac{x+5}{2x+1}$
9. 0.0016
10. $125^{-\frac{1}{3}} = \frac{1}{\sqrt[3]{125}} = \frac{1}{5} = 0.2$
11. $169^{0.5} = 13$
12. $8200 \times (1.15)^3 = 12471$