chapter 7

Algebra 3

Section 7.7 Exponential equations

PROJECT MATHS Text & Tests 6

Example 1

Solve these equations. (i) $\frac{1}{8^x} = 16^{\frac{1}{3}}$ (ii) $27^{x-3} = 3 \times 9^{x-2}$

Key: $2^3 = 8$, $2^4 = 16$

(i) $\Rightarrow \frac{1}{(2^3)^x} = (2^4)^{\frac{1}{3}}$

$2^{-3x} = 2^{4/3}$

Powers are equal $\Rightarrow -3x = 4/3$

$\div -3$ $x = -\frac{4}{9}$

(ii) $\Rightarrow (3^3)^{(x-3)} = (3)(3^2)^{(x-2)}$ (Bom DAS)

$3^{3x-9} = (3)\,3^{2x-4}$

$3^{3x-9} = 3^{2x-3}$

Key: $3^2 = 9$, $3^3 = 27$

$a \cdot a^n = a^{n+1}$ $\Rightarrow 3x - 9 = 2x - 3$

$x = 6$

Example 2

If $y = 3^x$, express 3^{2x} in terms of y.

Hence solve the equation $3^{2x} - 4.3^x + 3 = 0$.

write in terms of 3^x

$(3^x)^2 - 4(3^x) + 3 = 0$

Sub y for 3^x and solve

$y^2 - 4y + 3 = 0$

$(y-1)(y-3) = 0$

$y = 1, \quad y = 3$

now find x

$y=1 \Rightarrow 3^x = 1 \Rightarrow x = 0$

$y=3 \Rightarrow 3^x = 3 \Rightarrow x = 1$