3.6 Solving Exponential Equations

Solve the following 2 different ways: $27^{3-x} = 81^{2x+1}$

By writing as a exponential equation with a common base	Using Log Base 3
$\left(3^3\right)^{3-x} = \left(3^4\right)^{2x+1}$	$\log_3\left(27^{3-x}\right) = \log_3\left(81^{2x+1}\right)$
$3^{9-3x} = 3^{8x+4}$	$(3-x)\log_3(27) = (2x+1)\log_3(81)$
$9 - 3x = 8x + 4$	$(3-x)\,3 = (2x+1)\,4$
$9 - 4 = 8x + 3x$	$9 - 3x = 8x + 4$
$5 = 11x$	$9 - 4 = 8x + 3x$
$\dfrac{5}{11} = x$	$5 = 11x$
	$\dfrac{5}{11} = x$

Solve for x:

$5 \times 2^{x+3} = 75$	$3 \times 5^{x-2} = 4^{2x-3}$
$2^{x+3} = \dfrac{75}{5}$ $\qquad \Rightarrow x = \dfrac{\log\left(\frac{15}{8}\right)}{\log(2)}$	$\dfrac{(3)5^x}{5^2} = \dfrac{\left(4^2\right)^x}{4^3}$ $\Rightarrow x = \dfrac{\log\left(\frac{5^2}{3 \cdot 4^3}\right)}{\log\left(\frac{5}{16}\right)}$
$2^{x+3} = 15$ $\qquad \approx .907$	$\dfrac{5^x}{16^x} = \dfrac{5^2}{3 \cdot 4^3}$
$2^x 2^3 = 15$	$\left(\dfrac{5}{16}\right)^x = \dfrac{5^2}{3 \cdot 4^3}$
$2^x = \dfrac{15}{8}$	$x \log\left(\dfrac{5}{16}\right) = \log\left(\dfrac{5^2}{3 \cdot 4^3}\right)$
$x \log 2 = \log\left(\dfrac{15}{8}\right)$	$\boxed{\text{hint} \approx 1.75}$

Solve for x in terms of a, b, and c.

$$ab^{2x-1} = c^{x-4}$$

$$a\frac{b^{2x}}{b} = \frac{c^{x}}{c^{4}}$$

$$\frac{b^{2x}}{c^{x}} = \frac{b}{ac^{4}}$$

$$\left(\frac{b^{2}}{c}\right)^{x} = \frac{b}{ac^{4}}$$

$$x \log\left(\frac{b^{2}}{c}\right) = \log\left(\frac{b}{ac^{4}}\right)$$

$$x = \frac{\log\left(\frac{b}{ac^{4}}\right)}{\log\left(\frac{b^{2}}{c}\right)}$$

Written/Edited by:
Epp/Poelzer/Smith/Turner/Presta/Robertson/Simpson/Morgan/Hilton