Algebra RH **HW#**

Solve each equation for the unknown variable.

1) $8^{2x} = 4^6$

$(2^3)^{2x} = (2^2)^6$

$2^{6x} = 2^{12}$

$6x = 12$

$x = 2$

2) $9^{2b-3} = 27^{1-b}$

$(3^2)^{(2b-3)} = (3^3)^{(1-b)}$

$3^{4b-6} = 3^{3-3b}$

$4b - 6 = 3 - 3b$

$7b - 6 = 3$

$7b = 9$

$b = 9/7$

3) $27^x = 9^{x+2}$

$(3^3)^x = (3^2)^{(x+2)}$

$3^{3x} = 3^{2x+4}$

$3x = 2x + 4$

$x = 4$

4) $9^{3x} = 3^{3x+1}$

$(3^2)^{3x} = 3^{3x+1}$

$3^{6x} = 3^{3x+1}$

$6x = 3x + 1$

$3x = 1$

$x = \frac{1}{3}$

5) $4^{2x-3} = \left(\frac{1}{2}\right)^{3x}$

$(2^2)^{(2x-3)} = (2^{-1})^{3x}$

$2^{4x-6} = 2^{-3x}$

$4x - 6 = -3x$

$-6 = -7x$

$x = \frac{6}{7}$

6) $25^{3x-4} = \left(\frac{1}{125}\right)^{2x}$

$(5^2)^{(3x-4)} = (5^{-3})^{2x}$

$5^{6x-8} = 5^{-6x}$

$6x - 8 = -6x$

$-8 = -12x$

$\frac{8}{12} = x$

$\frac{2}{3} = x$

7) $\left(\frac{1}{9}\right)^{3x} = \left(\frac{1}{27}\right)^{x-1}$

$(3^{-2})^{3x} = (3^{-3})^{(x-1)}$

$3^{-6x} = 3^{-3x+3}$

$-6x = -3x + 3$

$-3x = 3$

$x = -1$

8) $(a^x)^{\frac{2}{3}} = \frac{1}{a^2}$

$a^{\frac{2}{3}x} = a^{-2}$

$\frac{2}{3}x = -2$

(see back)

$\frac{3}{2}\left(\frac{2}{3}x\right) = -2\left(\frac{3}{2}\right)$

$x = -3$

9) If $2^{4x+1} = 8^{x+a}$, which expression is equivalent to x?

(1) $a-1$

(2) $\frac{a-1}{15}$

(3) $3a-1$

(4) $\frac{a-1}{3}$

$2^{4x+1} = 8^{x+a}$

$2^{4x+1} = (2^3)^{x+a}$

$2^{4x+1} = 2^{3x+3a}$

$4x+1 = 3x+3a$

$x+1 = 3a$

$x = 3a-1$

10) If x is a positive integer, $4x^{\frac{1}{2}}$ is equivalent to

(1) $2x$

(2) $\frac{2}{x}$

(3) $4\sqrt{x}$

(4) $4\frac{1}{x}$

$4x^{\frac{1}{2}}$

$4 \cdot x^{\frac{1}{2}}$

$4\sqrt{x}$