Note Title 2008-03-10

Chp 5 Review

1 Solve

a) $79 \cdot 2^{x+1} = 7^{3x-4}$

$\log 79 + (x+1)\log 2 = (3x-4)\log 7.$

$\log 79 + x\log 2 + \log 2 = 3x\log 7 - 4\log 7$

$x\log 2 - 3x\log 7 = -4\log 7 - \log 79 - \log 2$

$x(\log 2 - 3\log 7) = -4\log 7 - \log 79 - \log 2$

$$x = \frac{(-4\log 7 - \log 79 - \log 2)}{(\log 2 - 3\log 7)} = \boxed{2.50}$$

b) $\log_5 x - \log_5(x-1) = \log_{25} 81$

$\log_5\left(\frac{x}{x-1}\right) = \log_5 9$

$\frac{x}{x-1} = 9$

$x = 9x - 9$

$9 = 8x$

$\boxed{\frac{9}{8} = x}$

OR

$\log_5 x = \log_5 9 + \log_5(x-1)$

$\log_5 x = \log_5(9)(x-1)$

$x = 9x - 9$

$9 = 8x$

$\boxed{\frac{9}{8} = x}$

c) $\log_2 x + \log_2(x-1) = 3$

$$\log_2((x)(x-1)) = 3$$

$$2^3 = x^2 - x$$

$$8 = x^2 - x$$

$$0 = x^2 - x - 8$$

$$\cancel{x = -2.37}$$

$$\boxed{x = 3.37}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{1 \pm \sqrt{1 - 4(1)(-8)}}{2(1)}$$

$$x = \frac{1 \pm \sqrt{33}}{2}$$

d) $(\log_x 8)(\log_8 7) = 2$

$$\left(\frac{\cancel{\log 8}}{\log x}\right)\left(\frac{\log 7}{\cancel{\log 8}}\right) = 2$$

$$\frac{\log 7}{\log x} = 2$$

$$\log_x 7 = 2 \qquad x^2 = 7$$

$$\boxed{\begin{array}{l} x = \pm\sqrt{7} \\ \text{OR} \\ x = 2.65 \end{array}}$$

e) $\log_3[\log_x(\log_2 8)] = -1$

$$\log_3[\log_x 3] = -1$$

$$3^{-1} = \log_x 3$$

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

$$\left(x^{\cancel{\frac{1}{3}}\,3}\right) = (3)^3$$

$$\boxed{x = 27}$$

2) Write $\log B + \log D - 5\log E - \log A^2 + \frac{1}{2}\log A$ as a single logarithm

$$\log\left(\frac{BDA^{\frac{1}{2}}}{E^5A^2}\right)$$

$$= \boxed{\log\left(\frac{BD}{A^{\frac{3}{2}}E^5}\right)}$$

$$\frac{A^{\frac{1}{2}}}{A^2} = A^{\frac{1}{2}-2} = A^{\frac{1}{2}-\frac{4}{2}} = A^{-\frac{3}{2}} = \frac{1}{A^{\frac{3}{2}}}$$

3. If $\log_4 3 = x$ and $\log_8 7 = y$, determine $\log_2 21$ in terms of x and y

$$\log_{\sqrt{4}} \sqrt{3} = x$$
$$\log_2 3^{\frac{1}{2}} = x$$
$$\frac{1}{2}\log_2 3 = x$$
$$\log_2 3 = 2x$$

$$\log_{\sqrt[3]{8}} \sqrt[3]{7} = y$$
$$\log_2 7^{\frac{1}{3}} = y$$
$$\log_2 7 = 3y$$

$$\log_2 21 = \log_2 3 + \log_2 7$$
$$= \boxed{2x + 3y}$$

Chp 5 Review Day 2

4 Determine the inverse of $y = \log\left(\frac{x}{2}\right)$

$$x = \log_{10}\left(\frac{y}{2}\right)$$

$$10^x = \frac{y}{2}$$

$$\boxed{y = 2(10^x)}$$

5. If $f(x) = 7^{\frac{x}{2}} - 3$ determine $f^{-1}(x)$

$$x = 7^{\frac{y}{2}} - 3$$

$$x + 3 = 7^{\frac{y}{2}}$$

LOGARITHMIC FORM

$$\frac{y}{2} = \log_7(x+3)$$

$$\boxed{y = 2\log_7(x+3)}$$

OR

$$\log(x+3) = \frac{y}{2}\log 7$$

$$2\log(x+3) = y\log 7$$

$$\frac{2\log(x+3)}{\log 7} = y$$

OR

$$\boxed{y = 2\log_7(x+3)}$$

6 A radioactive substance decays from 600 grams to 200 grams in 10 days. Determine the half life.

$$A = A_0\left(\tfrac{1}{2}\right)^{\frac{t}{c}}$$

$$200 = 600\left(\tfrac{1}{2}\right)^{\frac{10}{c}}$$

$$\frac{200}{600} = \left(\tfrac{1}{2}\right)^{\frac{10}{c}}$$

$$\log\left(\tfrac{1}{3}\right) = \frac{10}{c}\log\left(\tfrac{1}{2}\right)$$

$$c = \frac{10\log\left(\frac{1}{2}\right)}{\log\left(\frac{1}{3}\right)}$$

$$\boxed{c = 6.31\text{ days}}$$

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1-65 (not 37)

7 An earthquake in Victoria measured 5.2 on the Richter scale. An earthquake in Chile measured 7.8 on the Richter scale. How many times more intense was the earthquake in Chile?

$$\frac{10^{7.8}}{10^{5.2}} = \underline{\underline{10^{2.6}}} \text{ or } \underline{\underline{398.11}} \text{ times more intense}$$

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* 1-65 (not 37)