Homework Questions?

~~5~~
~~6d e~~
~~7d~~
~~9e 11a~~
~~13 11de~~

pg 475

$y = \log_2 4x$ $y = \log_2 8x$

$y = \log \frac{x}{2}$ $y = \log_2 x$

$\log_2(4x)$

$= \log_2 4 + \log_2 x$

$= 2 + \log_2 x$

$\log_2 \frac{x}{2} = \log_2 x - \log_2 2$

$= \log_2 x - 1$

6d) $\log_2 \sqrt{36} - \log_2 \sqrt{72}$

$= \log_2 \frac{\sqrt{36}}{\sqrt{72}}$

$= \log_2 \left(\frac{36}{72}\right)^{\frac{1}{2}}$

$= \log_2 \left(\frac{1}{2}\right)^{\frac{1}{2}}$

$= \frac{1}{2} \log_2 \frac{1}{2}$

$= \frac{1}{2}(-1)$

$= -\frac{1}{2}$

e) $\log_3 54 + \log_3 \left(\frac{3}{2}\right)$

$\log_3 \left(54 \times \frac{3}{2}\right)$

$\log_3 (81)$

$= 4$

~~9c~~
~~10a~~
11 de
13

7d) $\log_b \sqrt{x^5 y z^3}$

$= \log_b (x^5 y z^3)^{1/2}$

$= \frac{1}{2} \log_b (x^5 y z^3)$

$= \frac{1}{2} (\log_b x^5 + \log_b y + \log_b z^3)$

$= \frac{1}{2} (5 \log_b x + \log_b y + 3 \log_b z)$

9e) $\log_4 3 + \frac{1}{2} \log_4 8 - \log_4 2$

$= \log_4 3 + \log_4 8^{1/2} - \log_4 2$

$= \log_4 (3 \times \sqrt{8}) - \log_4 2$

$= \log_4 \left(\frac{3 \times \sqrt{8}}{2}\right)$

$= \log_4 \left(\frac{3 \times 2\sqrt{2}}{2}\right)$

$= \log_4 (3\sqrt{2})$

10a) $\log_2 x = 2 \log_2 7 + \log_2 5$

$= \log_2 7^2 + \log_2 5$

$= \log_2 (49 \times 5)$

$\log_2 x = \log_2 (245)$

$\therefore x = 245$

11d) $\log_2 x^2 - \log_2 xy + \log_2 y^2$

$= \log_2 \left(\frac{x^2}{xy}\right) + \log_2 y^2$

$= \log_2 \left(\frac{x^2 y^2}{xy}\right)$

$= \log_2 (xy)$

11e) $1 + \log_3 x^2$

$= \log_3 3 + \log_3 x^2$

$= \log_3 (3x^2)$

13) $\log_2 (8x^3)$

$= \log_2 (8) + \log_2 (x^3)$

$= 3 + 3 \log_2 x$

$y = 3 \log_2 x + 3$

↑ VS → 3 ↑ VT by 3

Lesson 8.05:

Solving Exponential Equations

Learning Goals:

I can solve and check any equation that contains exponential expressions.

I can apply what I have learned in unfamiliar settings

The formula to calculate the mass, M(t), remaining from an original sample of a substance with mass P_0, can be determined using the formula

$$M(t) = P_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$$

where t is time and h is the half-life. Recall that the half-life is the time required for a substance to reduce its initial mass, P, to one-half.

Example 1:

Jocelyn works in a lab that uses radioactive substances. The lab received a shipment of 200 g of radioactive iodine and after 7 days, 55.8163 g of the iodine was still remaining.

Calculate the half-life, to the nearest tenth of a day, of radioactive iodine.

$$\frac{55.8163}{200} = \frac{200\left(\frac{1}{2}\right)^{\frac{7}{h}}}{200}$$

$$\frac{55.8163}{200} = \left(\frac{1}{2}\right)^{\frac{7}{h}}$$

$$0.2791 \doteq \left(\frac{1}{2}\right)^{\frac{7}{h}}$$

$$\log(0.2791) \doteq \log\left(\left(\frac{1}{2}\right)^{\frac{7}{h}}\right)$$

$$\log(0.2791) \doteq \frac{7}{h}\log\left(\frac{1}{2}\right)$$

$$\frac{\log(0.2791)}{\log\left(\frac{1}{2}\right)} \doteq \frac{7}{h}$$

$$\frac{\log\left(\frac{1}{2}\right)}{\log(0.2791)} \doteq \frac{h}{7}$$

$$\frac{7\log\left(\frac{1}{2}\right)}{\log(0.2791)} \doteq h$$

$\therefore$ it has a half-life of 3.8 days

$$3.8 \doteq h$$

Example 2:

Solve $5^{x+1}=7^{x-2}$ to three decimal places

$5^{x+1} = (5^x)(5)$

$\log(5^{x+1}) = \log(7^{x-2})$

$(x+1)\log 5 = (x-2)\log 7$

$x\log 5 + \log 5 = x\log 7 - 2\log 7$

$x\log 5 - x\log 7 = -2\log 7 - \log 5$

$x(\log 5 - \log 7) = -2\log 7 - \log 5$

$$x = \frac{-2\log 7 - \log 5}{\log 5 - \log 7}$$

$\doteq 16.350$

Example 3:

Solve $25(2^x)=150$ to three decimal places

$$\frac{25(2^x)}{25} = \frac{150}{25}$$

$$2^x = 6$$

$$\log 2^x = \log 6$$

$$x \log 2 = \log 6$$

$$x = \frac{\log 6}{\log 2}$$

$$\doteq 2.585$$

Example 4:

Solve algebraically $9^{x+1} = \frac{1}{27}$

$9^{x+1} = 27^{-1}$

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

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

$\Rightarrow 2x+2 = -3$

$2x = -5$

$x = -\frac{5}{2}$

$\log_b b^x = x$

Example 5:

Solve algebraically $3^{x+2}-3^{x+1}=162$

$3^x \cdot 3^2 - 3^x \cdot 3^1 = 162$

$3^x(3^2 - 3^1) = 162$

$3^x(6) = 162$

$3^x = \frac{162}{6}$

$3^x = 27$

$\therefore x = 3$

$a^m \times a^n = a^{m+n}$

Homework:

pg. 485 -486

#1ce, 2ce, 3ce, 4ad, 5cde, 7,

8bf, 10, 11, 12