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Assignment #7  
MATH 171  
SOLUTIONS

Section 13.3

- ⑩  $\log_3 14 = \log_3 (7 \cdot 2)$   
 $= \log_3 7 + \log_3 2$
- ⑫  $\log_3 \left(\frac{2}{11}\right) = \log_3 2 - \log_3 11$
- ⑭  $\log_8 (n^5) = 5 \log_8 n$
- ⑯  $\log_2 \left(\frac{xy}{z^2}\right) = \log_2 x + \log_2 y - 2 \log_2 z$
- ⑰  $\log_4 \sqrt[7]{x} = \frac{1}{7} \log_4 x$
- ⑳  $\log_3 \left(\frac{\sqrt[3]{y}}{7}\right) = \frac{1}{3} \log_3 y - \log_3 7$
- ㉑  $\log_2 3 + \log_2 x = \log_2 3x$
- ㉒  $-\log_8 R + \log_8 V = \log_8 \left(\frac{V}{R}\right)$
- ㉔  $\log_4 3^3 + \log_4 9 = \log_4 (3^3 \cdot 9) = \log_4 243$
- ㉖  $\frac{1}{2} \log_b a - 2 \log_b 5 = \log_b a^{1/2} - \log_b 5^2$   
 $= \log_b \left(\frac{a^{1/2}}{5^2}\right) = \log_b \left(\frac{\sqrt{a}}{25}\right)$

$$\begin{aligned} \textcircled{37} \quad \log_3 18 &= \log_3 2 + \log_3 3^2 \\ &= \log_3 2 + 2 \end{aligned}$$

$$\begin{aligned} \textcircled{38} \quad \log_5 75 &= \log_5 3 + \log_5 25 \\ &= \log_5 3 + 2 \end{aligned}$$

$$\begin{aligned} \textcircled{39} \quad \log_2 \left(\frac{1}{6}\right) &= \log_2 1 - \log_2 6 \\ &= 0 - \log_2 (3 \cdot 2) \\ &= -\log_2 2 - \log_2 3 \\ &= -1 - \log_2 3 \end{aligned}$$

$$\begin{aligned} \textcircled{40} \quad \log_{10} (0.05) &= \log_{10} (5 \times 10^{-2}) \\ &= \log_{10} 5 + \log_{10} 10^{-2} \\ &= \log_{10} 5 - 2 \end{aligned}$$

$$\begin{aligned} \textcircled{41} \quad \log_3 \sqrt{6} &= \frac{1}{2} \log_3 6 \\ &= \frac{1}{2} (\log_3 3 + \log_3 2) \\ &= \frac{1}{2} (1 + \log_3 2) \end{aligned}$$

$$\begin{aligned} \textcircled{42} \quad \log_2 \sqrt[3]{24} &= \frac{1}{3} \log_2 24 \\ &= \frac{1}{3} (\log_2 8 + \log_2 3) \\ &= \frac{1}{3} (3 + \log_2 3) \\ &= 1 + \frac{1}{3} \log_2 3 \end{aligned}$$

$$\begin{aligned} \textcircled{43} \quad \log_{10} 3000 &= \log_{10} (3 \times 10^3) \\ &= \log_{10} 3 + \log_{10} 10^3 \\ &= \log_{10} 3 + 3 \end{aligned}$$

$$\begin{aligned} \textcircled{44} \quad \log_{10} (40^2) &= 2 \log_{10} 40 \\ &= 2(\log_{10} 10 + \log_{10} 4) \\ &= 2(1 + \log_{10} 4) \end{aligned}$$

$$\textcircled{51} \quad 5 \log_2 y - \log_2 x = 3 \log_2 4 + \log_2 a$$

$$\log_2 y^5 = 3 \log_2 4 + \log_2 a + \log_2 x$$

$$\log_2 y^5 = \log_2 4^3 + \log_2 ax$$

$$\log_2 y^5 = \log_2 (64 ax)$$

$$y^5 = 64 ax$$

$$y = (64 ax)^{1/5}$$

$$\textcircled{52} \quad 4 \log_2 x - 3 \log_2 y = \log_2 27$$

$$4 \log_2 x - \log_2 27 = 3 \log_2 y$$

$$\log_2 x^4 - \log_2 27 = \log_2 y^3$$

$$\log_2 \frac{x^4}{27} = \log_2 y^3$$

$$y^3 = \frac{x^4}{27}$$

$$y = \left(\frac{x^4}{27}\right)^{1/3} = \frac{x^{4/3}}{3}$$

$$(53) \quad \log_2 x + \log_2 y = 1$$

$$\log_2 y = \log_2 2 - \log_2 x$$

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

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

$$(54) \quad 3 \log_4 x + \log_4 y = 1$$

$$\log_4 x^3 + \log_4 y = \log_4 4$$

$$\log_4 y = \log_4 4 - \log_4 x^3$$

$$\log_4 y = \log_4 \left( \frac{4}{x^3} \right)$$

$$y = \frac{4}{x^3}$$

$$(55) \quad \frac{2 \log_5 x}{\log_5 3} - \log_5 y = 2$$

$$\left( \frac{1}{\log_5 3} \right) \log_5 x^2 - 2 = \log_5 y$$

$$\log_5 x^{2 \left( \frac{1}{\log_5 3} \right)} - \log_5 5^2 = \log_5 y$$

$$\log_5 \left( \frac{x^{\frac{2}{\log_5 3}}}{5^2} \right) = \log_5 y$$

$$y = \frac{x^{\frac{2}{\log_5 3}}}{25}$$

SECTION 13.4

3-12 USE CALCULATOR

(21)  $(5.98)(14.3)$

$$x = (5.98)(14.3)$$

$$\log x = \log (5.98)(14.3)$$

$$\log x = \log (5.98) + \log (14.3)$$

$$\log x = 1.932$$

$$x = 10^{1.932}$$

$$= 10 \times 10^{0.932}$$

$$= 8.5 \times 10^1$$

(22)  $x = \frac{895}{73.4^{86}}$

$$\log x = \log \left( \frac{895}{73.4^{86}} \right)$$

$$\log x = \log 895 - \log 73.4^{86}$$

$$\log x = \log 895 - 86 \log 73.4$$

$$\log x = 2.95 - 160.45$$

$$\log x = -157.498$$

$$x = 10^{-157.498}$$

$$x = 10^{-157} \cdot 10^{-0.498}$$

$$x = 0.317 \times 10^{-157}$$

$$= 3.17 \times 10^{-158}$$

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$$x = \frac{126000^{20}}{2.63^{2.5}}$$

$$\log x = \log \left( \frac{126000^{20}}{2.63^{2.5}} \right)$$

$$\log x = \log (126000)^{20} - \log 2.63^{2.5}$$

$$\log x = 20 \log 126000 - 2.5 \log 2.63$$

$$\log x = 102.007 - 1.05$$

$$\log x = 100.957$$

$$x = 10^{100.957}$$

$$= 10^{0.957} \times 10^{100}$$

$$x = 9.057 \times 10^{100}$$

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$$x = \sqrt[10]{7.32} (2470)^{30}$$

$$\log x = \frac{1}{10} \log(7.32) + 30 \log 2470$$

$$\log x = 101.867$$

$$x = 10^{101.867}$$

$$x = 10^{0.867} \times 10^{101}$$

$$x = 7.36 \times 10^{101}$$