

(1)

SOLUTIONS - Assignment 7
Assignment - LOGARITHMS
201-009-50
FALL 09

P. 142

$$\begin{aligned}\#15 \quad \log_5\left(\frac{ab}{c}\right) &= \log_5(ab) - \log_5 c \\ &= \boxed{\log_5 a + \log_5 b - \log_5 c}\end{aligned}$$

$$\begin{aligned}\#19 \quad \log_5\left(\frac{a^2 b^3}{25}\right) &= \log_5(a^2 b^3) - \log_5 25 \\ &= \log_5 a^2 + \log_5 b^3 - \log_5 25 \\ &= \boxed{2 \log_5 a + 3 \log_5 b - 2}\end{aligned}$$

$$\begin{aligned}\#20 \quad \log_b(a^2 b^3 \sqrt{c}) \\ &= \log_b a^2 + \log_b b^3 + \log_b c^{1/2} \\ &= 2 \log_b a + 3 \log_b b + \frac{1}{2} \log_b c \\ &= \boxed{2 \log_b a + 3 + \frac{1}{2} \log_b c}\end{aligned}$$

$$\begin{aligned}\#22 \quad \log \sqrt{\frac{a^2}{100 b^3}} &= \log \left(\frac{a^2}{100 b^3}\right)^{1/2} \\ &= \log \left(\frac{a}{10 b^{3/2}}\right) \\ &= \log a - \log 10 - \log b^{3/2} \\ &= \boxed{\log a - 1 - \frac{3}{2} \log b}\end{aligned}$$

$$\# 34 \quad 5 \ln x - 3 \ln x - 2 \ln \sqrt{x}$$

$$= 2 \ln x - 2 \ln x^{\frac{1}{2}}$$

$$= 2 \ln x - \ln x$$

$$= \boxed{\ln x}$$

$$\# 36 \quad \frac{1}{2} \log x + \frac{3}{2} \log 2y - \log x^2 y$$

$$= \log x^{\frac{1}{2}} + \log (2y)^{\frac{3}{2}} - \log x^2 y$$

$$= \log (x^{\frac{1}{2}} (2y)^{\frac{3}{2}}) - \log x^2 y$$

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

$$= \log ((2^3 x^{-3} y)^{\frac{1}{2}})$$

$$= \boxed{\log \sqrt{\frac{8y}{x^3}}}$$

$$\# 66 \quad \log_3 x + \log_3 (x+6) = 3$$

$$\log_3 (x \cdot (x+6)) = 3$$

$$3 \log_3 (x^2 + 6x) = 3^3$$

$$x^2 + 6x = 27$$

$$x^2 + 6x - 27 = 0$$

$$(x+9)(x-3) = 0$$

$$x = -9 \text{ or } x = 3$$

but log of a negative is impossible so

$$\boxed{x = 3}$$

93 $7^x = 101$

$$\ln 7^x = \ln 101$$

$$x \ln 7 = \ln 101$$

$$x = \frac{\ln 101}{\ln 7}$$

$$x = 2.37$$

102 $2^{x+1} = 3^{x-1}$

$$\ln 2^{x+1} = \ln 3^{x-1}$$

$$(x+1)\ln 2 = (x-1)\ln 3$$

$$x \ln 2 + \ln 2 = x \ln 3 - \ln 3$$

$$x \ln 2 - \ln 3 = -\ln 3 - \ln 2$$

$$x (\ln 2 - \ln 3) = -\ln 3 - \ln 2$$

$$x = \frac{-\ln 3 - \ln 2}{\ln 2 - \ln 3} = 4.42$$

105 $3(5^{x+1}) = 7^{1-x}$

$$\ln(3 \cdot 5^{x+1}) = \ln 7^{1-x}$$

$$\ln 3 + \ln 5^{x+1} = (1-x)\ln 7$$

$$\ln 3 + (x+1)\ln 5 = (1-x)\ln 7$$

$$\ln 3 + x \ln 5 + \ln 5 = \ln 7 - x \ln 7$$

$$x \ln 5 + x \ln 7 = \ln 7 - \ln 5 - \ln 3$$

$$x (\ln 5 + \ln 7) = \ln 7 - \ln 5 - \ln 3$$

$$x = \frac{\ln 7 - \ln 5 - \ln 3}{\ln 5 + \ln 7} = -0.214$$