H.W. SOLUTIONS: MATH 002 (Term 032)

Sec.# 4.4	Prob.# 7	Page# 339

SOLUTION:

$$\log_b x+\frac{1}{3}\left[\log_b y^2-\log_b z\right]$$

$$=\log_b x+\frac{2}{3}\log_b y-\frac{1}{3}\log_b z$$

Sec.# 4.4	Prob.# 14	Page# 339

SOLUTION:

$$\log_b\left[\left(y^3z^2\right)\left(\frac{x}{z}\right)^2\left(\frac{1}{x\sqrt{y}}\right)^3\right]=\log_b\frac{y\sqrt{y}}{x}$$

Sec.# 4.4	Prob.# 28	Page# 340

SOLUTION:

$$\log_7 45=\log_7\left(5\cdot3^2\right)=\log_7 5+2\log_7 3$$

$$=0.8271+2(0.5646)=1.9563$$

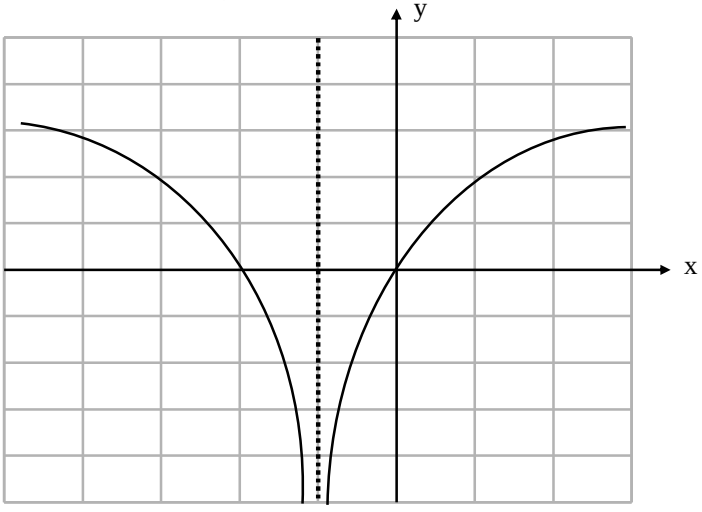
Sec.# 4.4	Prob.# 38	Page# 340

SOLUTION:

$$\log_{0.2}17=\frac{\log 17}{\log 0.2}=\frac{1.23045}{-0.69897}=-1.7604$$

Sec.# 4.4	Prob.# 46	Page# 340

SOLUTION: Graph $v(x)=\dfrac{\log(x+1)^2}{\log 2}=\dfrac{2\log|x+1|}{\log 2}$



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Sec.# 4.4	Prob.# 72	Page# 341

SOLUTION:

$$\log_5 20 \cdot \log_{20} 60 \cdot \log_{60} 100 \cdot \log_{100} 125 \quad \text{[change to common logarithm]}$$

$$= \frac{\log 20}{\log 5} \cdot \frac{\log 60}{\log 20} \cdot \frac{\log 100}{\log 60} \cdot \frac{\log 125}{\log 100} \quad \text{[by canceling]}$$

$$= \frac{\log 125}{\log 5} = \log_5 125 = \log_5 5^3 = 3\log_5 5 = 3$$

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SOLUTION:

$$-3 \le \log x \le -2 \quad [\textit{writing as powers of } 10]$$

$$\Rightarrow 10^{-3} \le 10^{\log x} \le 10^{-2}$$

$$\Rightarrow \frac{1}{1000} \le x \le \frac{1}{100}$$

$$\Rightarrow 0.001 \le x \le 0.01$$

$$\Rightarrow [0.001, 0.01]$$

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Sec.# 4.5	Prob.# 6	Page# 348

SOLUTION: Solve:

$$3^{4x-7} = \frac{1}{9}$$

$$\Rightarrow 3^{4x-7} = 3^{-2} \Rightarrow 4x - 7 = -2$$

$$\Rightarrow 4x = 5 \Rightarrow \quad x = \frac{5}{4}$$

Sec.# 4.5	Prob.# 16	Page# 348

SOLUTION:

$$e^{x+1} = 20 \quad [\textit{Taking } \ln \textit{ of both sides}]$$

$$\Rightarrow \ln e^{x+1} = \ln 20 \Rightarrow x + 1 = \ln 20 \Rightarrow \quad x = \ln 20 - 1$$

Sec.# 4.5	Prob.# 28	Page# 349

SOLUTION:

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

$$\Rightarrow \log 10 + \log(3x-1) = \log(2x+1) \log 10 + \log(3x-1) = \log(2x+1)$$

$$\Rightarrow \log(30x-10) = \log(2x+1)$$

$$\Rightarrow 30x - 10 = 2x + 1$$

$$\Rightarrow 28x = 11$$

$$\Rightarrow x = \frac{11}{28}$$

H.W. SOLUTIONS: MATH 002 (Term 032)

Sec.# 4.5	Prob.# 44	Page# 349

SOLUTION:

$$\frac{e^x - e^{-x}}{2} = 15 \quad \Rightarrow e^x - e^{-x} = 30$$

Multiply both sides by e^x and simplify

$e^{2x} - 30e^x - 1 = 0$. Let $y = e^x$

$\Rightarrow y^2 - 30y - 1 = 0$

Solving for y by the **Quadratic Formula,** we get

$y = 15 \pm \sqrt{226}$

$e^x = 15 \pm \sqrt{226} \Rightarrow \ln e^x = \ln(15 \pm \sqrt{226})$

$\Rightarrow x = \ln(15 \pm \sqrt{226})$

But logarithm is undefined for negatives,

$\Rightarrow \; x = \ln(15 + \sqrt{226})$

Sec.# 4.5	Prob.# 78	Page# 352

SOLUTION:

The incorrect step is $\log_2 (8+8) = \log_2 8 + \log_2 8$

Sec.# 4.5	Prob.# 79	Page# 352

SOLUTION:

Suppose $\log(x+y) = \log x + \log y$, [which is not true in general]

$\Rightarrow \log(x+y) - \log y = \log x$

$\Rightarrow \log \frac{x+y}{y} = \log x$

$\Rightarrow \frac{x+y}{y} = x \;\Rightarrow\; x + y = xy \Rightarrow x - xy = -y$

$\Rightarrow x(1-y) = -y \Rightarrow x = \frac{-y}{1-y}$

$\Rightarrow x = \frac{y}{y-1}$

For the above value of x, the first equation is true.

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