Problems for Gateway #3: Solving Exponential Equations

1. The value of x that solves the equation:

$$3 \cdot 10^x = 9 \cdot 7^x$$

is:

(a) $x = \dfrac{\log(10)}{\log(7)}$ **(b)** $x = \dfrac{\log(3)}{\log(10) - \log(7)}$

(c) $x = \dfrac{\log(7)}{3 \cdot \log(10)}$ **(d)** $x = \dfrac{9 \cdot \log(7)}{3 \cdot \log(10)}$

(e) $x = \dfrac{\log(3) + \log(9)}{\log(10) - \log(7)}$

2. The value of x that solves the equation:

$$8 \cdot 9^x = 4 \cdot 3^x$$

is:

(a) $x = \dfrac{\log(4)}{\log(8) - \log(9)}$ **(b)** $x = \dfrac{\log(8) + \log(4)}{\log(3) - \log(9)}$

(c) $x = \dfrac{\log(2)}{\log(3) - \log(9)}$ **(d)** $x = \dfrac{\log(2)}{\log(9)}$

(e) $x = \dfrac{\log(9)}{\log(3)}$

3. The value of x that solves the equation:

$$3 \cdot 6^x = 18 \cdot 7^x$$

is:

(a) $x = \dfrac{\log(18)}{\log(3)}$ **(b)** $x = \dfrac{7 \cdot \log(18)}{3 \cdot \log(6)}$

(c) $x = \dfrac{2 \cdot \log(6)}{\log(7)}$ **(d)** $x = \dfrac{\log(6)}{\log(6) - \log(7)}$

(e) $x = 1 - \dfrac{\log(6)}{\log(7)}$

4. The value of x that solves the equation:

$$2 \cdot 90^x = 12 \cdot 10^x$$

is:

(a) $x = \dfrac{\log(6)}{\log(90) - \log(10)}$ **(b)** $x = \dfrac{\log(24)}{\log\left(\frac{1}{9}\right)}$

(c) $x = \dfrac{12 \cdot \log(10)}{2 \cdot \log(90)}$ **(d)** $x = \dfrac{\log(12) + \log(2)}{\log(90) - \log(10)}$

(e) $x = \dfrac{\log(10)}{\log(90)}$

5. The value of x that solves the equation:

$$7 \cdot 2^x = 49 \cdot \left(\tfrac{1}{2}\right)^x$$

is:

(a) $x = \dfrac{\log(7) + \log(49)}{\log(2) - \log\left(\frac{1}{2}\right)}$ **(b)** $x = \dfrac{\log(7)}{\log(2) + \log\left(\frac{1}{2}\right)}$

(c) $x = \dfrac{\log(49)}{\log(7)}$ **(d)** $x = \dfrac{49 \cdot \log\left(\frac{1}{2}\right)}{7 \cdot \log(2)}$

(e) $x = \dfrac{\log(7)}{\log(2) - \log\left(\frac{1}{2}\right)}$

6. The value of x that solves the equation:

$$16 \cdot \left(\tfrac{1}{3}\right)^x = 64 \cdot \left(\tfrac{1}{4}\right)^x$$

is:

(a) $x = \dfrac{\log\left(\frac{1}{3}\right)}{\log\left(\frac{1}{4}\right)}$ **(b)** $x = \dfrac{\log(4)}{\log\left(\frac{1}{3}\right)}$

(c) $x = \dfrac{64 \cdot \log\left(\frac{1}{4}\right)}{16 \cdot \log\left(\frac{1}{3}\right)}$ **(d)** $x = \dfrac{\log(4)}{\log(3) + \log(4)}$

(e) $x = \dfrac{\log(4)}{\log\left(\frac{1}{3}\right) - \log\left(\frac{1}{4}\right)}$

7. The value of x that solves the equation:

$$32 \cdot 4^x = 128 \cdot \left(\tfrac{1}{4}\right)^x$$

is:

(a) $x = \dfrac{\log(4)}{\log(4) - \log\left(\frac{1}{4}\right)}$ **(b)** $x = \dfrac{\log(4)}{\log\left(\frac{1}{4}\right)}$

(c) $x = \dfrac{\log(128)}{\log(32)}$ **(d)** $x = \dfrac{128 \cdot \log\left(\frac{1}{4}\right)}{32 \cdot \log(4)}$

(e) $x = \dfrac{4 \cdot \log(32)}{\frac{1}{4} \cdot \log(128)}$

8. The value of x that solves the equation:

$$7 \cdot \left(\tfrac{1}{7}\right)^x = 49 \cdot \left(\tfrac{1}{49}\right)^x$$

is:

(a) $x = \dfrac{\log\left(\frac{1}{7}\right)}{\log\left(\frac{1}{49}\right)}$ **(b)** $x = \dfrac{\log(7)}{\log\left(\frac{1}{7}\right) - \log\left(\frac{1}{49}\right)}$

(c) $x = \dfrac{49 \cdot \log\left(\frac{1}{49}\right)}{7 \cdot \log\left(\frac{1}{7}\right)}$ **(d)** $x = \dfrac{\log\left(\frac{1}{7}\right)}{\log\left(\frac{1}{7}\right) + \log\left(\frac{1}{49}\right)}$

(e) $x = \dfrac{\log(49)}{\log(7)}$

9. The value of x that solves the equation:

$$17 \cdot \left(\tfrac{1}{6}\right)^x = 51 \cdot \left(\tfrac{1}{3}\right)^x$$

is:

(a) $x = \dfrac{51 \cdot \log\left(\frac{1}{3}\right)}{17 \cdot \log\left(\frac{1}{6}\right)}$ **(b)** $x = \dfrac{\frac{1}{3} \cdot \log(51)}{\frac{1}{6} \cdot \log(17)}$

(c) $x = \dfrac{\log(3)}{\log\left(\frac{1}{6}\right) - \log\left(\frac{1}{3}\right)}$ **(d)** $x = \dfrac{\log(3)}{17 \cdot \log\left(\frac{1}{6}\right) + 51 \cdot \log\left(\frac{1}{3}\right)}$

(e) $x = 3 + \dfrac{1}{\log\left(\frac{1}{6}\right) - \log\left(\frac{1}{3}\right)}$

10. The value of x that solves the equation:

$$4 \cdot \left(\tfrac{1}{8}\right)^x = 64 \cdot \left(\tfrac{1}{3}\right)^x$$

is:

(a) $x = \dfrac{\log(64)}{\log(4)}$ **(b)** $x = \dfrac{\log(64) + \log(4)}{\log\left(\tfrac{1}{8}\right) - \log\left(\tfrac{1}{3}\right)}$

(c) $x = \dfrac{64 \cdot \log\left(\tfrac{1}{3}\right)}{4 \cdot \log\left(\tfrac{1}{8}\right)}$ **(d)** $x = \dfrac{\log(16)}{\log\left(\tfrac{1}{8}\right) - \log\left(\tfrac{1}{3}\right)}$

(e) $x = \dfrac{\tfrac{1}{8} \cdot \log(16)}{\tfrac{1}{3} \cdot \log\left(\tfrac{1}{8}\right)}$

ANSWERS:

1.	B	**2.**	C	**3.**	D	**4.**	A
5.	E	**6.**	E	**7.**	A	**8.**	B
9.	C	**10.**	D				