4.4: (Laws of Logarithms)

Which one of the following statements is TRUE? A) $\frac{\log_{2a} 16}{\log_{2a} 4} = 2$ for any real number $a > 0$, and $a \neq \frac{1}{2}$. B) $\log(x+y) = \log x + \log y$ for all positive real numbers x and y. C) $\log(5x) - \log(2x) = \log(3x)$ for all real numbers $x > 0$. D) $\log(2x) = 2\log x$ for all real numbers $x > 0$. E) $\log x^2 = 2\log x$ for all real numbers x.	Laws of Logarithms.
Which one of the following statements is TRUE? A) $\ln x > 0$, if $x > 1$ B) $\frac{\ln x}{\ln y} = \ln\frac{x}{y}, x > 0, y > 0$ C) $\ln x^2 = 2\ln x$, for any real number x D) $e^{\ln x} = e^x$ E) $\ln(x+y) = \ln x + \ln y, x > 0, y > 0$	Laws of Logarithms.
Let $a > 1$ and $y > 0$. If $\log_8 a = x + 1$ and $\log_a y = \frac{1}{3}$, then $2^x =$ A) y B) $y - 2$ C) $\frac{y}{2}$ D) $2y$ E) y^2	Laws of Logarithms.
If $8\log_{25}\sqrt[4]{125} + \frac{\ln 2}{\ln 5} - 5^{\log_{25} 9} = \log_5 A$, then $A =$ A) 5 B) 2 C) 1 D) 8 E) 4	Laws of Logarithms.

$(\sqrt{10})^{2\log 2} + \log_{\frac{2}{5}}\left(\frac{4}{25}\right) =$ A) 4 B) $\frac{1}{4}$ C) 6 D) 8 E) 2	Laws of Logarithms.
The x-intercept of the graph of the function $f(x) = e^{2\ln 3} + \ln e^{(\ln x - \ln 4)}$ is A) $4e^{-9}$ B) $9e^{-4}$ C) $-4e^{-9}$ D) $4e^{9}$ E) $-8\ln 3$	Laws of Logarithms.
If $\log_3(x+1) = \frac{1}{2}$, then $\log_3(3x^2 + 6x + 3) =$ A) 2 B) $\frac{3}{2}$ C) 4 D) $\frac{7}{2}$ E) $\frac{5}{2}$	Laws of Logarithms.
If $\log_3(5) = y$, then $\log_5(9) =$ A) $\frac{2}{y}$ B) $\frac{3}{y}$ C) $3y$ D) $2y$ E) y^2	Laws of Logarithms.

If $\frac{1}{x}\log_2(e) = y$, then $\ln 8 =$ A) $\frac{3}{xy}$ B) $\frac{3y}{x}$ C) $\frac{3x}{y}$ D) $\frac{x}{3y}$ E) $3xy$	Laws of Logarithms.
Let $x > 1$. If $\log_{0.5}(x-1) = a$, then $\log_8(2x^2 - 4x + 2)$ A) $\frac{1+2a}{3}$ B) $\frac{2a-1}{3}$ C) $1 - 2a$ D) $\frac{1-2a}{3}$ E) $\frac{1-2a}{6}$	Laws of Logarithms.
If x, y and z are positive real numbers, then, $\log_5 x + 4\log_{25} y - 3\log_5 z =$ A) $\log_5 \frac{x^2y^4}{3z}$ B) $\log_5 \frac{xy^8}{z^6}$ C) $\log_5 \frac{x^2y^4}{z^3}$ D) $\log_5 \frac{xy^4}{z^6}$ E) $\log_5 \frac{xy^2}{z^3}$	Laws of Logarithms.

$(\log_{\sqrt{2}} 8)(\log_{32} \sqrt[3]{25})(\log_{5^{-2}} 4) =$ A) $-\frac{4}{5}$ B) $\frac{4}{5}$ C) $-\frac{1}{3}$ D) $\frac{1}{3}$ E) -3	Laws of Logarithms.
$\left(\frac{1}{10}\right)^{\log 3} + \log_{\frac{3}{2}}\left(\frac{8}{27}\right) =$ A) $-\frac{8}{3}$ B) 0 C) $\frac{10}{3}$ D) 6 E) $-\frac{2}{3}$	Laws of Logarithms.
If $A = 2^{\log_8 125}$ and $B = (\log_{\sqrt{2}} 9)(\log_3 \sqrt{8})$, then $B + A =$ A) 11 B) 1 C) 10 D) 0 E) 12	Laws of Logarithms.

Which one of the following statements is always TRUE for the real numbers $x > 0, y > 0, x \neq 1$ and $y \neq 1$? A) $\frac{\ln x}{\ln y} = -\frac{\log_x x}{\log_x \frac{1}{y}}$ B) $(\log_y x)(\log_x y) = -1$ C) $(\log_y x)^n = n\log_y x$ D) $\log_x \frac{1}{y} = \log_y x$ E) $\log_x(x + y^2) = 1 + 2\log_x y$	Laws of Logarithms.
Which one of the following statements is TRUE for all $x > 0, y > 0, b > 0$ and $b \neq 1$? A) $\log_b \sqrt{x} = \frac{\ln x}{2\ln b}$ B) $\log_b(x + y) = \log_b x + \log_b y$ C) $(\log_b x)(\log_b y) = \log_b(xy)$ D) $\log_b \left(\frac{x}{y}\right) = \frac{\log_b x}{\log_b y}, y \neq 1$ E) $\frac{\log_b x}{\log_b y} = \log_b x - \log_b y, y \neq 1$	Laws of Logarithms.
If $\log_3(5) = a$ and $\log_3(2) = b$, then $\log_{\sqrt{2}}(30) =$ A) $\frac{2+2a+2b}{b}$ B) $\frac{2a+2b+2b^2}{b}$ C) $\frac{\sqrt{1+a+b}}{b}$ D) $\frac{2a}{b^2}$ E) $2 + 2a + 2b$	Laws of Logarithms.

If $\log 5 = a,\ \log 3 = b$, then $\log_3(45) =$ A) $\frac{a+2b}{a}$ B) $\frac{2a+2b}{b}$ C) $\frac{a+2b}{b}$ D) $\frac{2a+b}{b}$ E) $\frac{a+b}{2b}$	Laws of Logarithms.
If $\log_6 3 = a$, then $\log_2 108 =$ A) $\frac{a+2}{1-a}$ B) $\frac{a-2}{1-a}$ C) $\frac{a+3}{1-a}$ D) $\frac{a-3}{1-a}$ E) $\frac{a-2}{1+a}$	Laws of Logarithms.
If $\log_6 2 = x$, then $\frac{1}{2}\log_2 144 =$ A) $\frac{x+1}{x}$ B) $x + 1$ C) $\frac{x}{x-1}$ D) $\frac{1}{x}$ E) $\sqrt{x}$	Laws of Logarithms.

If $(a, 0)$ is the x-intercept and $(0, b)$ is the y - intercept of the function $f(x) = \log\left(\frac{1}{2}\right) + \log(20 - 2x)$, then $a + b =$ A) 10 B) 8 C) -8 D) -10 E) 12	Laws of Logarithms.
If $x > 0,\ x \neq 1,\ y > 0, \ln x = u$ and $\ln y = v$, then the expression $\log_x\left(\sqrt[3]{x}y^4\right)$ simplifies to A) $\frac{1}{3} + 4\frac{v}{u}$ B) $3 + 4\frac{u}{v}$ C) $\frac{1}{3}u + 4v$ D) $3u + 4v$ E) $\frac{1}{3}u + \frac{4}{3}v$	Laws of Logarithms.
If $\log 2 = t$, then $\log 800 - \log\left(\frac{1}{25}\right) =$ A) $t + 4$ B) $t + 2$ C) $5t + 4$ D) $5t + 2$ E) $2t + 3$	Laws of Logarithms.

The exact value of the expression $\left(\log_{49} \sqrt[3]{7} + \sqrt{\log_{0.5} \frac{1}{16}}\right)$ is equal to A) $\frac{13}{6}$ B) $\frac{25}{6}$ C) $\frac{7}{3}$ D) $\frac{7}{2}$ E) $\frac{2}{3}$	Laws of Logarithms.
If the expression $-1 + \log_{16} x^3y^4 + \log_{\frac{1}{8}} x^4y^3$ where $x > 0,\ y > 0$, is written as a single logarithm with base 2, then it is equal to A) $\log_2\left(\frac{1}{2x^{7/12}}\right)$ B) $\log_2\left(\frac{y}{2x^{5/12}}\right)$ C) $\log_2\left(\frac{x^{7/12}}{2y}\right)$ D) $\log_2\left(-x^{5/12}\right)$ E) $\log_2\left(-x^{5/12}y\right)$	Laws of Logarithms.
The exact value of the expression $\left(\log_5 \sqrt[4]{25} + \log_{0.01} 1000\right)$ is equal to A) -1 B) $\frac{13}{2}$ C) $-\frac{11}{2}$ D) $-\frac{5}{2}$ E) -2	Laws of Logarithms.

If $\log 2 = x$ then $\log 1600 + \log\frac{1}{5}$ is equal to A) $5x - 1$ B) $3x + 3$ C) $3x$ D) $5x + 1$ E) $5x - 2$	Laws of Logarithms.
The expression $1 + 2\ln x - \frac{\ln(x+1)}{2} + \log_{\sqrt{e}}\sqrt{5}$ can be written as A) $\ln\left(\frac{5ex^2}{\sqrt{x+1}}\right)$ B) $\ln\left(\frac{\sqrt{5}ex^2}{\sqrt{x+1}}\right)$ C) $\ln\left(25x^2\sqrt{x+1}\right)$ D) $\ln\left(\frac{5x}{\sqrt{x+1}}\right)$ E) $\ln\left(\frac{5ex^2}{x+1}\right)$	Laws of Logarithms.
If the expression $-1 + 6\log_{\frac{1}{8}}(wx) - 4\log_{\sqrt{2}}\left(\frac{1}{y}\right)$ is written as a single logarithm with base 2, then it is equal to A) $\log_2\frac{3(wx)^2}{2y^4}$ B) $\log_2\frac{y^8}{2(wx)^2}$ C) $\log_2\frac{2y^4}{(wx)^2}$ D) $\log_2\frac{y^2}{2(wx)^2}$ E) $\log_1\frac{2y^2}{(wx)^2}$	Laws of Logarithms.

If $\log 2 = a$ and $\log 3 = b$, then $\frac{\log_2 \frac{9}{2}}{\log_2 10}$ in terms of a and b is equal to A) $2b - a$ B) $\frac{a+b}{2}$ C) $\frac{2}{ab}$ D) $\frac{ab}{2}$ E) $a - 2b$	Laws of Logarithms.
$\log_{\frac{3}{2}}\left(\frac{8}{27}\right) + \sqrt{3}^{\left(\frac{\log 4}{\log 3}\right)} =$ A) 0 B) -1 C) 1 D) 2 E) -2	Laws of Logarithms.
If $\log_3 2 = a$ and $\log_3 5 = b$, then $\log 9$ in terms of a and b is equal to A) $\frac{2}{a+b}$ B) $\frac{1}{a} + \frac{2}{b}$ C) $\frac{ab}{2}$ D) $\frac{a+b}{2}$ E) $\frac{2}{ab}$	Laws of Logarithms.

If $\ln 2 = x$ and $\ln 6 = y$, then $\log_9(12) =$ A) $\frac{x+y}{2y-2x}$ B) $\frac{x+y}{y+2x}$ C) $\frac{x-y}{2y+2x}$ D) $\frac{x+y}{x-y}$ E) $\frac{x-y}{x+y}$	Laws of Logarithms.
If $x > 0, y > 0$ and $w > 0$, then $\log(y^3 w^2) - 3\log(x\sqrt{y}) + 2\log\frac{x}{w} =$ A) $\log\frac{y\sqrt{y}}{x}$ B) $\log\frac{y\sqrt{y}}{w}$ C) $\log\frac{y}{x}$ D) $\log\frac{\sqrt{y}}{x}$ E) $\log\frac{y}{w}$	Laws of Logarithms.
If $m > 0$, the expression $-\frac{2}{3}\log_5(5m^2) + \frac{1}{2}\log_5(25m^2) + \log_5\sqrt[3]{\frac{m}{5}}$ A) 0 B) 1 C) 5 D) $\frac{5}{m}$ E) $\frac{m}{5}$	Laws of Logarithms.

If $\log 2 = x$ and $\log 6 = y$, then $\log 15 =$ (A) $y - 2x + 1$ B) $2y - x + 1$ C) $2y - x + 2$ D) $\frac{y-x}{x}$ E) $\frac{y+x}{x}$	Laws of Logarithms.
If $\ln(4) = x$ and $\ln(5) = y$, then $\log_{\frac{4}{5}}\left(\frac{16e^2}{125}\right)$ can be written in terms of x and y as: A) $\frac{2x+2-3y}{x-y}$ B) $\frac{2x-2-3y}{x-y}$ C) $\frac{2x-2+3y}{x-y}$ D) $\frac{2x+2-3y}{x+y}$ E) $\frac{2x-2-3y}{x+y}$	Laws of Logarithms.
The expression $-\frac{2}{3}\log_7(5m^2) + \frac{1}{2}\log_7(25m^2) + \log_7 \sqrt[4]{25}$ where $m > 0$ is equal to (A) $\log_7 \frac{5^{5/6}}{m^{1/3}}$ B) $-\log_7 m^{1/3}$ C) $-\log_7 m^3$ D) $-\log_7 \frac{5^{1/3}}{m^{56}}$ E) $\log_7 \frac{m^{1/3}}{5^{5/6}}$	Laws of Logarithms.

If $A = (\sqrt[3]{2})^{\log_2 27}$ and $B = (\log_2 81) \cdot (\log_{\sqrt{3}} 16)$, then $B - A =$ A) 29 B) -5 C) -23 D) -29 E) 5	Laws of Logarithms.
If $\log 3 = t$ and $\log 2 = x$, then $2 + \log(0.09) + \log 5 =$ A) $2t - x + 1$ B) $3t + x$ C) $3t - x$ D) $2t + 1$ E) $2t + x + 1$	Laws of Logarithms.
Which one of the following statements is TRUE? A) $y = \log_{(a-1)} x$ is defined if $a > 1, a \neq 2$, and $x > 0$ B) $\log(abc) = (\log a)(\log b)(\log c)$ C) $\log(a + b + c) = \log(a) + \log(b) + \log(c)$ D) $\ln 7 - \ln 2 = \frac{\ln 7}{\ln 2}$ E) $\ln x^2 = 2\ln x$, for any real number x	Laws of Logarithms.
If $A = (\log_5 81)(\log_3 5)(\log_2 \sqrt{a})$ and $B = e^{-\ln(1/4)}$, then $B^A =$ A) a^4 B) a^8 C) a D) $-a$ E) a^{-1}	Laws of Logarithms.

If $\log 0.4 = x$, then $\log_2 20 =$ A) $\frac{x+3}{x+1}$ B) $x + 1$ C) $\frac{x+1}{2}$ D) $x - 1$ E) $\frac{x+1}{x-1}$	Laws of Logarithms.
If $x > 0$ and $\frac{\log_{\sqrt{5}}(4)}{\log_{25}(x^2)} = 2\log 10$, then $x =$ A) 4 B) 2 C) 1 D) $2\ln 2$ E) $\frac{1}{2}$	Laws of Logarithms.
If $A = \frac{\log_{\sqrt{5}} 8}{\log_{25} 100}$, then the value of 10^A is equal to (a) 64 (b) -4 (c) 3 (d) 32 (e) 6	Laws of Logarithms.

Which one of the following statements is TRUE? (a) $\log\left(x+\sqrt{x^2-1}\right)=-\log\left(x-\sqrt{x^2-1}\right)$ for any $x \geq 1$ (correct) (b) $(\log x)^3 = 3\log x$ for any $x > 1$ (c) The equation $e^x = -1$ has a real solution (d) $f(x) = \ln x - \ln(x-2)$ is defined on $(-\infty, 0) \cup (2, \infty)$ (e) $\ln(x-1) < 0$ when $x < 1$	Laws of Logarithms.