
Complete the following problems. Show all work to receive full credit.

1. Compute the following logarithms. No work is necessary on this portion of the quiz.

(a) $\log_3 9 = 2$ since $3^2 = 9$

(b) $\log_9 3 = \frac{1}{2}$ since $9^{\frac{1}{2}} = \sqrt{9} = 3$

(c) $\ln \frac{1}{\sqrt{e}} = -\frac{1}{2}$ since $e^{-\frac{1}{2}} = \frac{1}{\sqrt{e}}$

(d) $\ln 1 = 0$ since $e^0 = 1$.

2. Solve the following equations:

(a) $3 - 2^{-x} = 0$

$$3 = 2^{-x}$$

$$3 = \frac{1}{2^x}$$

$$3 \cdot 2^x = 1$$

$$2^x = \frac{1}{3}$$

$$\log_2 2^x = \log_2 \frac{1}{3} \text{ or } x \ln 2 = \ln \frac{1}{3}$$

$$x = \log_2 \frac{1}{3} \text{ or } x = \frac{\ln \frac{1}{3}}{\ln 2}$$

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

$$\ln \left(\frac{x^2 + 1}{2x} \right) = 3$$

$$e^3 = \frac{x^2 + 1}{2x}$$

$$2e^3 x = x^2 + 1$$

$$0 = x^2 - 2e^3 x + 1$$

$$\begin{aligned} x &= \frac{2e^3 \pm \sqrt{4e^6 - 4(1)(1)}}{2} \\ &= \frac{2e^3 \pm \sqrt{4e^6 - 4}}{2} \\ &= \frac{2e^3 \pm 2\sqrt{e^6 - 1}}{2} \\ &= e^3 \pm \sqrt{e^6 - 1} \end{aligned}$$