

REVIEW

Exponential and Logarithmic functions

Math 120R

1. Evaluate without a calculator

(a) $(4L^{2/3}P)^{3/2}(P)^{-3/2}$

(b) $x^e(x^e)^2$

(c) $(a^{-1} + b^{-1})^{-1}$

(d) $\sqrt{M+2}(2+M)^{3/2}$

(e) $\frac{4A^{-3}}{(2A)^{-4}}$

(f) $\log\left(\frac{100 \cdot \sqrt[3]{10}}{0.001 \sqrt[5]{10}}\right)$

(g) $\log_a(a^{14}a^{-1/2}\sqrt[4]{a})$

2. Find the mistake in each (if there is one):

(a) $\log(x) - \log(y) = \frac{\log(x)}{\log(y)}$

(b) $\log(x^2y) = 2 \cdot \log(x) + \log(y)$

(c) $10^{3 \cdot \log(x)} = 3x$

(d) $\ln(0) = 1$

(e) $\log_2(x) + \log_3(y) = \log_6(xy)$

(f) $\log_2\left(\frac{1}{x}\right) = -\log_2(x)$

(g) $\log(x) - \log(y) + \log(z) = \log\left(\frac{xz}{y}\right)$

(h) $\ln(10^x) = x$

3. Solve for x exactly:

(a) $9^x - 7 \cdot 3^x = -6$

(b) $\ln\left(\frac{e^{4x} + 3}{e}\right) = 1$

(c) $\frac{\ln(8x) - 2 \ln(2x)}{\ln(x)} = 1$

(d) $\ln(\ln x) = 0$

(e) $\frac{2}{1 + e^{0.05x}} = 0.5$

(f) $5^{9x} = 4^{7x-3}$

- (g) $(e^{3x+1})^2 = e^{10x}$
- (h) $\log_2(x) + \log_2(x-2) = 3$

4. **True or False?**

- (a) The function $y = \log x$ has an asymptote at $y = 0$
 - (b) The function $y = \log(b^t)$ is always equal to $y = (\log b)^t$
 - (c) The values of $\ln e$ and $\log 10$ are both 1.
 - (d) The graphs of the functions $y = e^x$ and $y = \ln x$ are both concave up.
 - (e) In the formula $Q = ab^t$, if $a > 1$, the graph always rises as we read from left to right.
 - (f) If $f(x) \rightarrow k$ as $x \rightarrow \infty$ we say that the line $y = k$ is a horizontal asymptote.
 - (g) $\ln\left(\frac{x^2y}{e^2}\right)^{1/3}$ is equal to $\frac{1}{3}(2\ln x + \ln y - 2)$.
 - (h) If $50(0.345)^t = 4$ then $t = \frac{\log(4/50)}{\log(0.345)}$
 - (i) The graph of $y = \ln x$ is increasing.
 - (j) The x -intercept for the natural log function is $(1,0)$ and the y -intercept is $(0, e)$.
5. What is the domain, the x -intercept and the vertical asymptote of $y = 10 - \log(5n - 230)$?
6. The world population has been growing roughly exponentially for the past 30 years. In 1987, the world population was 5 billion. In 1998 it is approximately 6 billion. When does this model estimate that the world population reached 4 billion?
7. Radioactive substance has half-life of 10 years. Find the equation that describes the quantity of the substance present at time t using the continuous exponential model. Explain what k tells you. What percentage of the original amount would remain after 22 years?
8. Suppose 80 ounces of a radioactive substance decays to 9 ounces in 9 hours. What is the half-life of the substance?