

Practice Problems - Lecture 23

Problem 1. Solve the following exponential equations. Give exact answers and simplify as much as possible:

- (a) $5^x = 13$;
- (b) $2^{x+3} = 5^{2x}$;
- (c) $e^{x^4} = 1000$;
- (d) $e^{1-3x} \cdot e^{5x} = 2e$;
- (e) $\left(\frac{1}{9}\right)^x = -9$;
- (f) $e^{2x} - 8e^x + 15 = 0$.

Problem 2. Solve the following logarithmic equations, giving exact answers:

- (a) $3 \ln x = 9$;
- (b) $\log_5(8 - 3x) = 3$;
- * (c) $\log x + \log(2x + 1) = 1$;
- (d) $\log_5[(3x + 5)(x + 1)] = 1$;
- (e) $\ln(3x + 5) - \ln(2x + 4) = 0$;
- (f) $\log_2(5x - 6) - \log_2(x + 1) = \log_2 3$;
- * (g) $\log x + \log(3x - 13) = \log 10$.

* - for participation grade 8, please select ONE of these two problems to present to me on the board in my office (Little 457). You may prepare notes to help you, but you should be able to explain on your own (without help from me or another student) how to solve the equation. This can only be done during office hours or by scheduling a different time with me, not during or at the end of class. You have until Wednesday, December 9 to do this.

Answers:

1. (a) $x = \frac{\ln 13}{\ln 5}$ (or $x = \frac{\log 13}{\log 5}$); (b) $x = \frac{\ln 8}{\ln(25/2)}$ (or $x = \frac{\log 8}{\log(25/2)}$);
(c) $x = \pm\sqrt[4]{\ln 1000}$; (d) $x = \ln \sqrt{2}$; (e) \emptyset ; (f) $x = \ln 5$ or $x = \ln 3$.
2. (a) $x = e^3$; (b) $x = -39$; (d) $x = 0$ or $x = -\frac{8}{3}$;
(e) $x = -1$; (f) $x = \frac{9}{2}$;