**Week 9 - Problems**

We will start reviewing material from earlier weeks and put it all together.

1. Explain how you convert between a logarithmic and exponential equation. Give examples.

2. What is the difference between the log and the ln button on your graphing calculator? Explain the difference using \(\ln 100\) and \(\log 100\) as an example.

3. Between what two whole numbers is \(\log 9456\)? Explain your reasoning.

4. Find \(\log_3 18\) and explain its meaning.

5. Work through Examples 6 and 7 in section 4.3 on page 317. Does it make a difference whether you use the common logarithm or the natural logarithm to compute \(\log_5 8\)?

6. Explain why logarithmic functions are not defined for negative numbers.

7. A student finds \(\log_5 145\) to be 2.3617. Argue without using a calculator that this cannot be correct.

8. Work through Example 8 in section 4.3 starting on page 317. What different methods do you have at your disposal to graph \(y = \log_5 x\)?

9. Work through Example 10 in section 4.3 starting on page 319. How can you find out without a calculator where \(y = \ln (x+3)\) has a vertical asymptote?

10. Explain how you graph \(y = -\log(x+4)\) without a calculator. Describe the characteristics of the graph.

11. Work through Example 11 in section 4.3 starting on page 320. According to this model is it true that people in larger cities walk faster on average than people in small towns? What is the difference in average walking speed between people living in a city of 500,000 and a city of 2 million?
12. Work through Example 12 in section 4.3 on page 321. Compare the intensity of an earthquake of magnitude 7 on the Richter scale with an earthquake of magnitude 6 on the Richter scale.

13. Read example 6 on page 328 and then express the following in terms of sums and differences of logarithms: \( \log_2 \left( \frac{16x^2 y^5}{3(x^2 - 1)^3} \right) \).

14. Compare the graphs of \( f(x) \) and \( f(100x) \) a. \( f(x) = x^2 \), b. \( f(x) = \frac{1}{x} \), c. \( f(x) = \log x \). Describe what you find in each case. What kind of a shape do you expect \( f(100x) \) to have? What does that mean for the logarithmic function?

15. In detail list the main properties each of polynomials, rational, exponential and logarithmic functions.

16. Find a function in each category: a. defined for all \( x \) and having the line \( y = 3 \) as a horizontal asymptote, b. Defined on the interval \((\infty, 2)\) and a logarithmic function, c. Defined on \((\infty, 1) \cup (1, \infty)\) with a horizontal asymptote \( y = 2 \).

17. Simplify \( \log_7 \left( \left( \frac{7x}{3x + 2} \right)^{\ln 7} \right)^{\frac{1}{2}} \).

Find an equation for \( f(x) \) for each graph. It is obtained from one of the basic functions by translations and reflections. Asymptotes are dashed. Explain how you found the equation without a calculator.

18. 
19. 
20.