

1. (8pts) Evaluate without using the calculator:

$$\log_5 25 = \quad \log_{1000} 10 = \quad \log_c \sqrt[6]{c^7} = \quad \log_{25} 125 = \quad (\text{think root})$$

2. (4pts) Use your calculator to find  $\log_7 3$  with accuracy 4 decimal places. Show how you obtained your number.

3. (13pts) Write as a sum and/or difference of logarithms. Express powers as factors. Simplify if possible.

$$\log((4y + 1)^5 \sqrt[3]{5x - 6}) =$$

$$\log_8 \left( \frac{\sqrt{y^3}}{64x^7} \right) =$$

4. (13pts) Write as a single logarithm. Simplify if possible.

$$4 \log(2x^3) - 3 \log(4x^5) =$$

$$3 \ln(x^2 - x - 30) + \ln(x + 5) - 2 \ln(x - 6) =$$

5. (8pts) How much should you invest in an account bearing 4.25%, compounded quarterly, if you wish to have \$4,000 in four years?

6. (8pts) Draw the graphs of the exponential function  $f(x) = b^x$  for  $0 < b < 1$  and for  $b > 1$ . What is the range in both cases?

7. (12pts) Let  $f(x) = -\log_2(x - 3)$ .

a) What is the domain of  $f$ ?

b) Use transformations to draw the graph of  $f$ , starting with the graph of  $y = \log_2 x$ . Indicate the  $x$ -intercept and any asymptotes.

Solve the equations.

8. (8pts)  $3^{x+2} = \left(\frac{1}{9}\right)^{2-x}$

9. (12pts)  $\log_9(x + 6) + \log_9(x + 4) = \log_9(3x + 12)$

**10.** (14pts) Five years ago, the population of Bunny City was 45,000, today, it is 57,000. Assume that the population grows according to the usual formula  $N(t) = N_0e^{rt}$ .

a) Find the growth rate  $r$  and write the function that describes the population of B.C.

b) If the city continues to grow at the same rate, what will be its population four years from now?

**Bonus** (10pts) What is a better deal: a savings account with a 4% interest rate, compounded monthly, or a savings account with a 4.125% interest rate, compounded quarterly? (*Hint: compare them over one year.*)