

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

$$\log_3 81 = \qquad \log_5 \frac{1}{125} = \qquad \log_a \sqrt[7]{a^3} = \qquad \log_{\sqrt{b}} b^3 =$$

2. (4pts) Use the change-of-base formula and your calculator to find  $\log_7 17$  with accuracy 6 decimal places. Show how you obtained your number.

3. (5pts) If  $\log_a 12 = c$  and  $\log_a 5 = d$ , express in terms of  $c$  and  $d$ :

$$\log_a 60 = \qquad \log_a \frac{144}{125} =$$

4. (6pts) Write as a sum and/or difference of logarithms. Express powers as factors. Simplify if possible.

$$\log_7 \frac{49x^3}{\sqrt[3]{y^8}} =$$

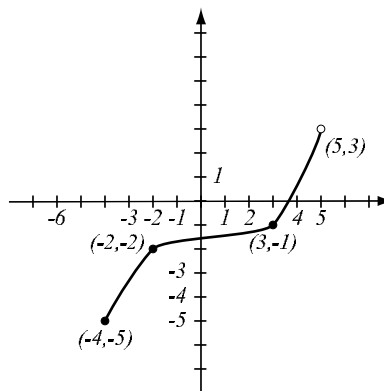
5. (12pts) Write as a single logarithm. Simplify if possible.

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

$$3\ln(x^2 + 7x - 18) - 2\ln(x + 9) - 4\ln(x - 2) =$$

6. (6pts) The graph of a function  $f$  is given.

- Is this function one-to-one? Justify.
- If the function is one-to-one, find the graph of  $f^{-1}$ , labeling the relevant points.



7. (9pts) Let  $f(x) = \frac{3x + 1}{4x - 1}$ ,  $x \geq 0$ .

- Find the formula for  $f^{-1}$ .
- Find the range of  $f$ .

8. (6pts) Using transformations, draw the graph of  $f(x) = e^{-x} + 3$ . Explain how you transform the graph of a basic function in order to get the graph of  $f$ . Indicate at least one point on the graph and any asymptotes.

9. (6pts) Find the domain of the function  $f(x) = \log_2(4x + 5) + \log_3(2 - 7x)$  and write it in interval notation.

10. (8pts) How much should you invest in an account bearing 4.02%, compounded quarterly, if you wish to have \$10,000 in five years?

Solve the equations.

11. (8pts)  $2^{x+1} = 3^{1-x}$

12. (10pts)  $\log_3(x - 2) + \log_3(x + 6) = 2$

**13.** (12pts) The population of Orlando, FL was 128,000 in 1980 and 238,000 in 2010. Assume that it has grown according to the formula  $P(t) = P_0e^{kt}$ .

a) Find  $k$  and write the function that describes the population at time  $t$  years since 1980. Graph it on paper.

b) Find the predicted population in the year 2015.

**Bonus** (10pts) Let  $f(x) = x^2 - 6x$ , considered for  $x \leq 3$ .

a) Sketch the graph of  $f$  and verify that the function is one-to-one.

b) Find the formula for the inverse of this function.