

Please circle when you plan to take the final: Monday Thursday

Spring '04/MAT 140/Exam 5, in-class part **Name:** _____ *Show all your work.*

1. (5pts) Evaluate (do not use the calculator):

$$\log_3 27 = \qquad \log_5 \frac{1}{125} = \qquad \log_2 \sqrt{8} = \qquad \ln e^4 =$$

2. (6pts) Solve the equations. Convert to exponential form if necessary.

$$9^{2x} = 27 \qquad \log_x e = \frac{1}{2}$$

3. (5pts) Write as a sum and/or difference of logarithms. Express powers as factors. Simplify if possible

$$\log_3 \left(\frac{27}{x^5} \right) =$$

$$\log_2(x^4 \sqrt{x+1}) =$$

4. (2pts) Use your calculator to find $\log_6 24$ to with accuracy 4 decimal places. Show how you obtained your number.

5. (5pts) The number of watts w provided by a space satellite's power supply after d days is given by the formula $w = 50e^{-0.004d}$. Answer the following with accuracy 4 decimal points.

a) What is the power of the satellite after 40 days?

b) How long will it take for the power to drop to 20 watts?

6. (4pts) \$1000 is put into an account bearing 7% interest yearly. How much is in the account after 2 years if interest is compounded

a) monthly

b) continuously?

The rules: you may use your book and notes on this take-home exam. Your work is to be entirely your own: you may not talk to anybody else about the exam problems. Turn the exam in by 3:30PM Thursday, April 29th.

7. (7pts) The function $f(x) = 3 - 2^x$ is given.

- a) Use the graph of a basic exponential function to sketch its graph on paper. Explain how the basic graph is to be transformed in order to get the graph of the given function. Label at least two points on the graph.
- b) What are the domain and range of f ?
- c) What is the horizontal asymptote of the graph?

8. (6pts) Write each the following as a sum and/or difference of logarithms. Express powers as factors. Simplify if possible.

$$\ln(4x) - 2 \ln x =$$

$$3 \log_6 u + 4 \log_6 v^3 - 2 \log_6 v^2 =$$

9. (5pts) Solve the equation: $2^{x-1} = 5^{x+1}$. (Hint: take the logarithm of both sides.)

10. (5pts) The normal healing of wounds can be represented by an exponential function. If the wound initially has an area of 2 square inches then the formula $A = 2e^{-0.35n}$ describes the area of the wound A after n days of healing. How long does it take for the wound to shrink to $1/4$ of the original size (accuracy: 4 decimal points)?

Bonus. (5pts) You have \$1000 to invest. What yearly interest rate should you get if this investment is to grow to \$4500 in 6 years? (Assume yearly compounding.)