

Exam 3a

Name _____

Math 143

May 2, 2003

Show all work and simplify all answers. If you use your calculator to arrive at a conclusion, state what you did on your calculator. Give exact numerical answers unless you are instructed to make a decimal approximation.

1. [10 points] Let $f(x) = 3^x$. Show that $\frac{f(x+h) - f(x)}{h} = 3^x \left(\frac{3^h - 1}{h} \right)$. Show all steps.

2. [15 points] Graph $y = 1 - e^{x-1}$. Specify the domain, range, intercepts, and asymptotes.

3. [10 points] Let $f(x) = 3^x + 1$.
- (a) Find the inverse of f .

 - (b) What is the domain of the inverse of f ?

 - (c) What is the range of the inverse of f ?
4. [5 points] Give a decimal approximation to $\log_3 7$.
5. [10 points] Write the quantity using sums and differences of simpler logarithmic expressions. Express the answer so that logarithms of products, quotients, and powers do not appear.

$$\log_2 \sqrt{\frac{x+1}{x-1}}$$

6. [10 points] Solve for x : $\ln(x + 1) - 1 = \ln(1 - x)$

7. [10 points] Solve the inequality $2(3 - .4^x) < 5$.

8. [10 points] Suppose that \$7,000 is invested at 5% interest compounded monthly. How long will it take for the balance to reach \$10,000?

9. [25 points] Hospitals utilize the radioactive substance iodine-131 in the diagnosis of conditions of the thyroid gland. The half-life of iodine-131 is eight days.

(a) Determine the decay constant k for iodine-131.

(b) If a hospital acquires 2 g of iodine-131, how much of this sample will remain after 20 days?