

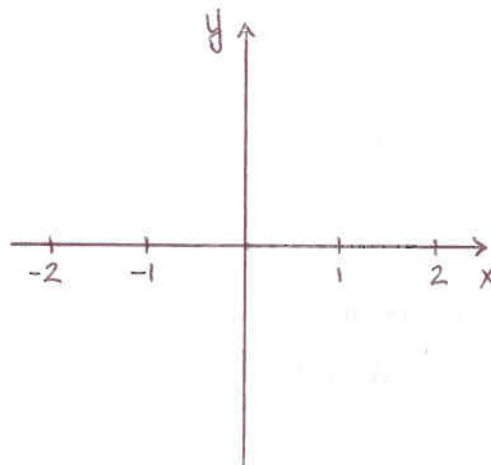
College Algebra, Math 143, Kriloff
Exam 3, Fall 2002

Instructions: Show your work! If you use a calculator, write what you computed or sketch the graph you used. Include intermediate steps. Multiple answers or a correct answer without a reasonable amount of work might receive no credit. Give exact answers unless asked for decimal approximations. When finished, check your work by hand or on your calculator.

1. (6 points) Use properties of exponents to solve for y in the equation $2^{4+2^{3y}} = \frac{1}{\sqrt{2}}$.

2. (12 points) For any function of the form $f(x) = b^x$ with $0 < b < 1$, fill in the following blanks with intervals, values, or the word none.

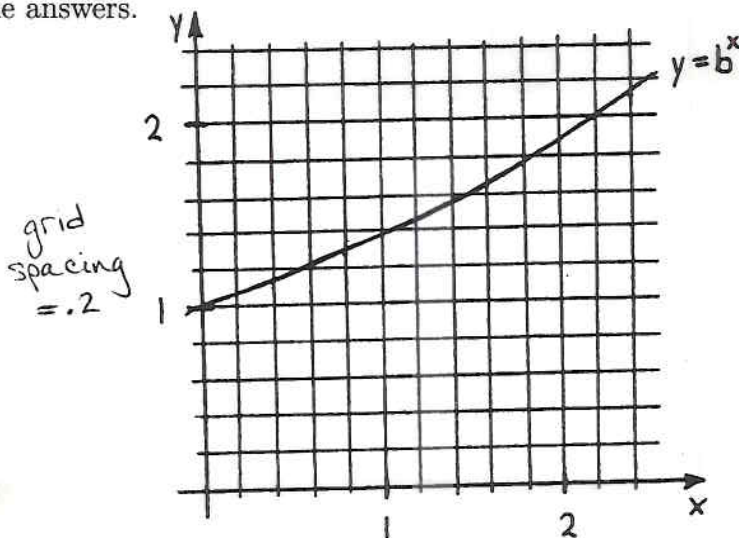
- (a) The domain of f is _____.
- (b) The range of f is _____.
- (c) The x -intercept(s) of f is _____.
- (d) The y -intercept of f is _____.
- (e) As $x \rightarrow \infty$, $f(x) \rightarrow$ _____.
- (f) Sketch a graph of the function, making appropriate marks on the y -axis.



3. (4 points) The graph of an exponential function $y = b^x$ is sketched below. Use that graph to estimate $b^{0.6}$ and $\log_b(1.4)$, each rounded to one decimal place. Mark the graph below to show how you got the answers.

$b^{0.6} \approx$

$\log_b(1.4) \approx$



4. (6 points) State the precise definition of a logarithmic function.

5. (8 points) True or false; no explanation necessary.

(a) $(70^{20})^5 = 70^{100}$

(b) $\log_3 2 < 1$

(c) $\ln 2x^3 = 3 \ln 2x$

(d) Doubling time for an account depends on the amount of money currently in the account.

6. (6 points)

(a) Write $4^{-3} = \frac{1}{64}$ in logarithmic form.

(b) Write $\log_9(\sqrt{3}) = \frac{1}{4}$ in exponential form.

7. (10 points)

(a) Write $\frac{1}{3} \log_a(8) - 2 \log_a(3) + \log_a(36)$ as a logarithm of a single number.

(b) Write $\ln \left(\frac{x^2}{\sqrt{1+x^2}} \right)$ using sums or differences of simpler logarithmic expressions. Express your answer so that logarithms of products, quotients, or powers do not appear.

8. (10 points)

(a) Find the domain of $\log_6(1 + 5x)$.

(b) Solve the inequality $\log_6(1 + 5x) \leq 2$.

9. Solve the following equations and inequality. Give exact answers and show **all** steps by hand to receive full credit.

(a) (8 points) $\log_2(x) + \log_2(3x + 1) = 1$

(b) (6 points) $5^x = 3^{2x-1}$

(c) (4 points) $4e^{-x} \geq 12$

10. (4 points) In what important context does the number e naturally arise?
11. (6 points) A sum of \$1000 is placed in a savings account at a nominal interest rate of 7% per annum. How much is in the account after 20 years if interest is compounded quarterly and no additional deposits or withdrawals are made?
12. (10 points) The half-life of plutonium-241 is 13 years. How much of an initial 2 g sample remains after 5 years? Give your answer as a decimal approximation rounded to two decimal places.