Math 160, Brief Calculus, Kriloff

Exam 1

Show all work completely on the pages below including a brief description of any graphical use of your calculator. Include labels and scales for axes, units, and a brief description of what your answer represents when appropriate. When finished, **check** your work wherever possible.

1. (11 points) Suppose $c = f(t)$ describes the concentration of a drug in a patient's bloodstream as a function of time in minutes after the patient takes a pill.

   (a) If c is given in mg/L, state the meaning of $f(90) = 27$.

   (b) Use function notation to write the concentration after 2 hours.

   (c) Sketch on the axes a reasonable graph for the function.

2. (12 points) The table shows world bicycle production in millions.

Year	1950	1960	1970	1980	1990
Bicycles	11	20	36	62	92

   (a) Find and interpret the average rate of change in production between 1950 and 1980.

   (b) Is this function concave up or concave down and how can you tell?

3. (10 points) A company that makes chairs has fixed costs of \$6000 and variable costs of \$28 per chair. The company sells the chairs for \$43 each. How many chairs must the company sell to make money?

4. (12 points)

t	0	3	6	9
$f(t)$	14.4	9.9	6.8	4.7

(a) Explain why the function represented by the table appears to be exponential.

(b) Find a possible formula for the function represented by the table.

5. (5 points) State in words the meaning of $y = \ln(x)$ (in other words, give the definition).

6. (9 points) Suppose a rabbit population grows exponentially and is modeled by $P = 6(1.04)^t$ where t is in days. How long does it take to have 100 rabbits?

7. (6 points) Suppose bank A pays 5.2% interest compounded continuously. If bank B compounds interest annually, what interest rate must they give in order to yield the same balance as bank A after one year? (This is what bank A would report as the *annual percentage yield* or APY.)

8. Let $y = \ln(\sqrt{3t+2}) - 7$.

   (a) (5 points) Use the variable u for the inside function to express y as a function of u. Write both u as a function of t and y as a function of u.

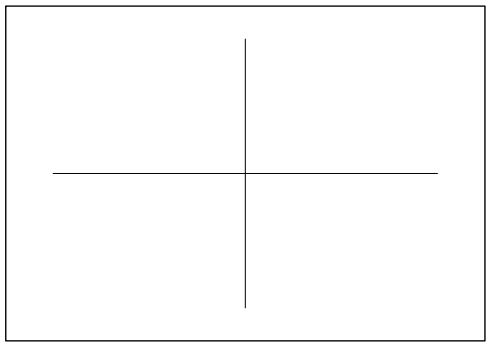
   (b) (3 points) Use a logarithm property to rewrite y in a different form so that no logarithms of powers or products appear.

9. (7 points) Let $f(x) = 4^x$ and $g(x) = x^2 - 1$.

   (a) Find and simplify: $g(f(x)) =$

   (b) Find $f(g(2)) =$

10. (6 points) Draw a rough graph of the overall behavior of $f(x) = 3x^3 + ax^2 - 5x^7 + 2x^4 - b$ and label the y-intercept. The graph can have at most _____ turning points.
    (a and b stand for positive real numbers)



11. (8 points) Explain how to transform the graph of $f(x)$ in order to obtain the graph of $y = -4f(x + 5)$.