

Name _____

RULES FOR THIS TEST:

- Do not borrow another student's calculator.
 - Circle each final answer.
 - A correct answer will only be given full credit if enough work is shown to justify that answer.
-

1. (13 points) Cathy opened a savings account which earned 6% interest compounded continuously. She made two deposits into this account — her original deposit of \$1000 on April 2, 1990, and a deposit of \$2000 on April 2, 1992. Assuming that she did not make any withdrawals, how much money was in her savings account on April 2, 1993? Give your answer to two decimal places after the decimal point.

2. (12 points) Tables for the five functions, $f(x)$, $g(x)$, $h(x)$, $p(x)$, and $w(x)$, are shown below. Write the word **linear** by each function which could be linear, and write the word **exponential** by each function which could be exponential. There may be more than one function of each type, and some functions may be neither linear nor exponential. You do not need to find formulas for any of the functions.

x	$f(x)$
0	4
7	2
14	0
21	-2

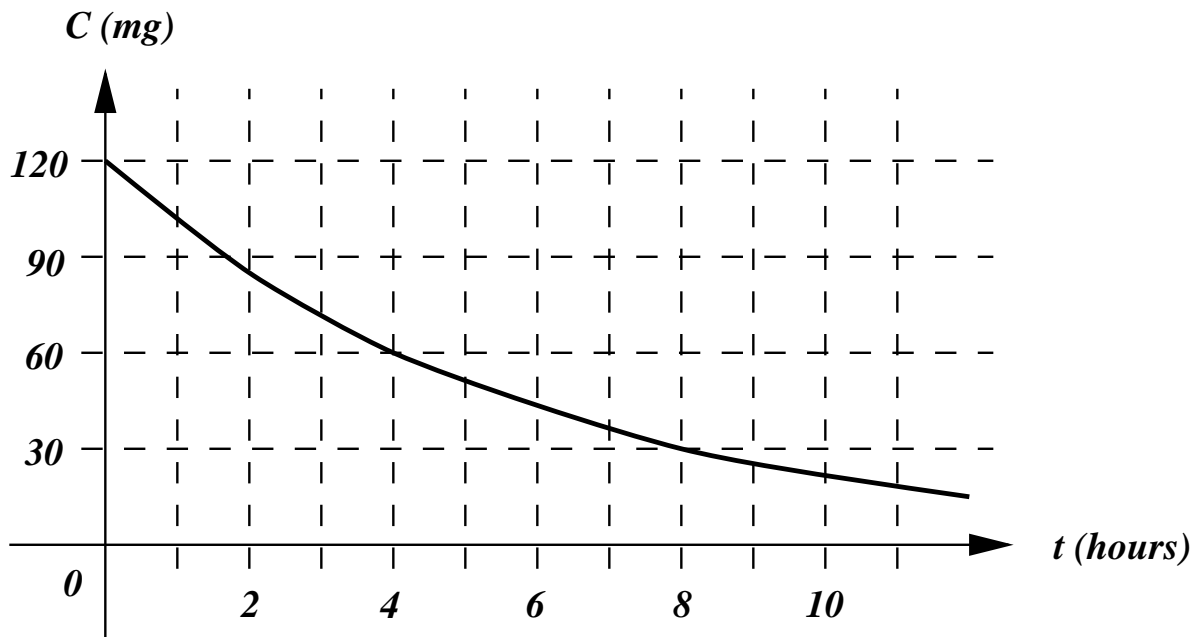
x	$g(x)$
0	2
7	4
14	16
21	256

x	$h(x)$
0	4
7	12
14	36
21	108

x	$p(x)$
0	50
7	10
14	2
21	0.4

x	$w(x)$
0	6
7	18
14	30
21	42

3. (15 points) The figure below shows the amount of caffeine, $C = f(t)$, in mg , in a person's bloodstream as a function of the time, t , in hours, since the person finished a cup of coffee.



- (a) Estimate $f(8)$ and interpret it in terms of caffeine levels.
- (b) Find the average rate of change in the caffeine levels between $t = 0$ and $t = 8$. Give units with your answer and interpret it in terms of caffeine levels.

(c) About how many hours have passed before the caffeine level is down to 75 mg ?

(d) What is the vertical intercept? What does it represent in terms of caffeine?

(e) If this function had a horizontal intercept, what would it represent?

4. (12 points) Given that $200 = 20(1.03)^t$, find the exact value of t using logarithms. Also give the approximate decimal value using your calculator.

5. (12 points) A company manufactures and sells basketballs. The cost function, $C(q)$, and the revenue function, $R(q)$, are each **linear** and are given in the table below where q represents the number of basketballs, and cost and revenue are each given in dollars.

q	0	150	300	450	600	750
$C(q)$	2500	2980	3460	3940	4420	4900
$R(q)$	0	1050	2100	3150	4200	5250

- (a) What are the fixed costs (in dollars) for the production of these basketballs?
- (b) A formula for the revenue function is given by $R(q) = 7q$. Find a formula for the cost function, $C(q)$.
- (c) Find the break-even point for the production and sale of these basketballs. If the company sells less than this number of basketballs, do they earn a profit or suffer a loss?

6. (12 points) Technetium-99m is the most widely used radioisotope in diagnostic nuclear medicine. It has a half-life of six hours. If a person is injected with Technetium-99m, how long does it take until there is only 8% of the substance remaining in the person's body? Give your answer to the nearest hour.

7. (12 points) In 1931, a town had a population of 8500 people, but there are fewer people living there today. Town records show that the population has been decreasing by 4% per year since 1931.

(a) Write a formula for $P(t)$, the population of this town at time t , where t represents the number of years since 1931.

(b) How many people live in the town today, in 2001? Round off your answer to the nearest integer.

8. (12 points) Use any feature of your calculator to find all solutions to the equation

$$e^{0.05x} = 100 - 2x.$$

Your answer should be given to two decimal places after the decimal point. You should explain clearly what you did. If you made a table, show some entries from the table. If you obtained a graph, show a quick sketch of the graph, and explain what you then did to obtain your answer.