## Mathematics 122 Test \#1

Name:
You are to use your own calculator, no sharing.
Show your work to get credit. This means that if you use your calculator to solve a problem, then you have to write a sentence telling how you used it to do the calculations. (That is if you graphed it and zoomed in then say that is what you did etc.)
(1) (10 Points.) The figure below shows the amount $A$ in milligrams of drug in a patients system $t$ hours after it is administered.

(a) How many milligrams are there is the patients system after8 hours?
(b) How long after the drug is administered is it at half the initial amount?
(c) What is the average rate of change of the amount of the drug in the body between during the first four hours after the drug is administered.
(d) Estimate the instantaneous rate of change of the amount of the drug in the body 8 hours after it was administered.
(2) (10 Points) Corresponding values of $p$ and $q$ are given by the table:

$$
\begin{array}{c|c|c|c|c}
p & 0 & 2 & 4 & 7 \\
\hline q & -4 & 2 & 8 & 17
\end{array}
$$

Assuming that the relationship between $p$ and $q$ is linear answer the following:
(a) Find $p$ as a linear function of $q$.
(b) Find $q$ as a linear function of $p$.
(c) What is the value of $q$ when $p=13$ ?
(3) (10 points) Solve the following using your calculator and give your answer to three decimal places.
(a) $x^{5}+x+20=0$

$$
x=
$$

$\qquad$
(b) $3^{2 r}=10-4 r$.

$$
r=
$$

$\qquad$
(4) (15 points) A company has a cost function of $C(q)=3000+2 q$ and a revenue function of $R(q)=8 q$.
(a) What are the fixed costs for the company?
(b) What is the variable cost per unit?
(c) What price is the company charging for its product?
(d) Find the break even point $q_{0}$
(e) Graph $C(q)$ and $R(q)$ on the same axes and label the break even point.
(5) (15 Points) Fifty guppies (at type of small but fast breeding fish) are released in Lake Murray. Assume the population of grows exponentially and that after 3 years there are 150 guppies in Lake Murray.
(a) Give a formula for the number $G(t)$ of guppies $t$ years after the first 50 were released.

$$
G(t)=
$$

$\qquad$
(b) What is the doubling time of the number for the population of guppies?
(c) How long before there are a million guppies?
(6) (10 points) The weight $w$ of a dog is proportional to the the cube of its height $h$. If a dog that is 20 in tall weights 40 lbs , then
(a) Give a formula relating $h$ and $w$.
(b) What is the weight of a dog that is 36 inches tall?
(7) (10 Points) Let $y=f(x)$ have the following graph.

(a) For which of the labeled points is $f^{\prime}(x)>0$ ?
(b) For which of the labeled points is $f^{\prime}(x)<0$ ?
(c) For which of the labeled points is $f^{\prime}(x)=0$ ?
(d) At which of the labeled points is $f^{\prime}(x)$ the largest?
(8) (5 Points) What is the effective annual yield of a money invested at $8 \%$ if (a) It is compounded monthly?
(b) It is compounded continuously?
(9) (10 points) Let $f(x)=(3.1)^{x}$.
(a) What is the average rate of change of $f$ on the interval from $x=2$ to $x=2.1$
(b) What is the average rate of change of $f$ on the interval from $x=2$ to $x=2.01$
(c) What is a good estimate for the instantaneous rate of change of $f$ at $x=2$.
(10) (10 points) Let $f(x)=2 x^{2}+x$ and $g(x)=3 x-4$. Then compute the following (a) $f(-2)$
(b) $f(g(3))$
(c) $\frac{f(x+h)-f(x)}{h}$ and simplify your answer.

