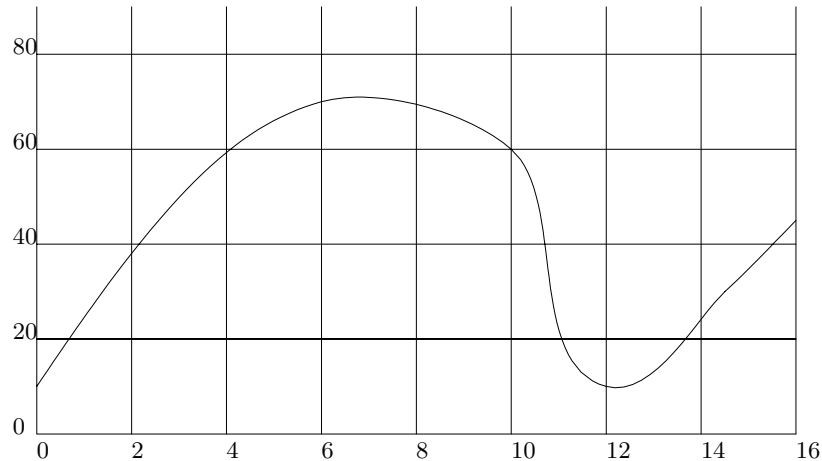**Mathematics 122 Test #1**   Name: _____

You are to use your own calculator, no sharing.

Show your work to get credit.

(1) (10 Points.) The figure below shows the number of roaches living in a dorm as a function of weeks of time after the dorm was opened.

(a) How many roaches are there after 10 weeks?   _____

(b) What is the largest number of Roaches that were in the dorm?

_____

(c) At what time does if look like someone put out roach posion?

_____

(d) What was the average rate of change in the number of roaches between the 2nd and 10th week?.

_____

(e) Estimate the instantaneous rate of change of the roaches at the 2nd week.

_____

(2) (15 Points) Corresponding values of p and q are given by the table:

p	1	3	5	7
q	5	8	11	14

(a) Explain why these values can come form a linear function.

(b) Find q as a linear function of p. _____

(c) What is the value of q when $p = 20$? _____

(3) (5 points) Solve $3(4.1)^{2x} = 5$ and give your answer to three decimal places.

_____

(4) (10 points) The weight w of a pine tree is proportional to the the cube of its height h. A pine tree that is 10 feet tall weights 80 pounds.

(a) Give a formula relating h and w. _____

(b) What is the wight of a pine tree that is 150 feet tall? _____

(5) (5 points) If \$1000.00 is invested at 10% interest compounded quarterly how many years does it take to become \$10,000.00?
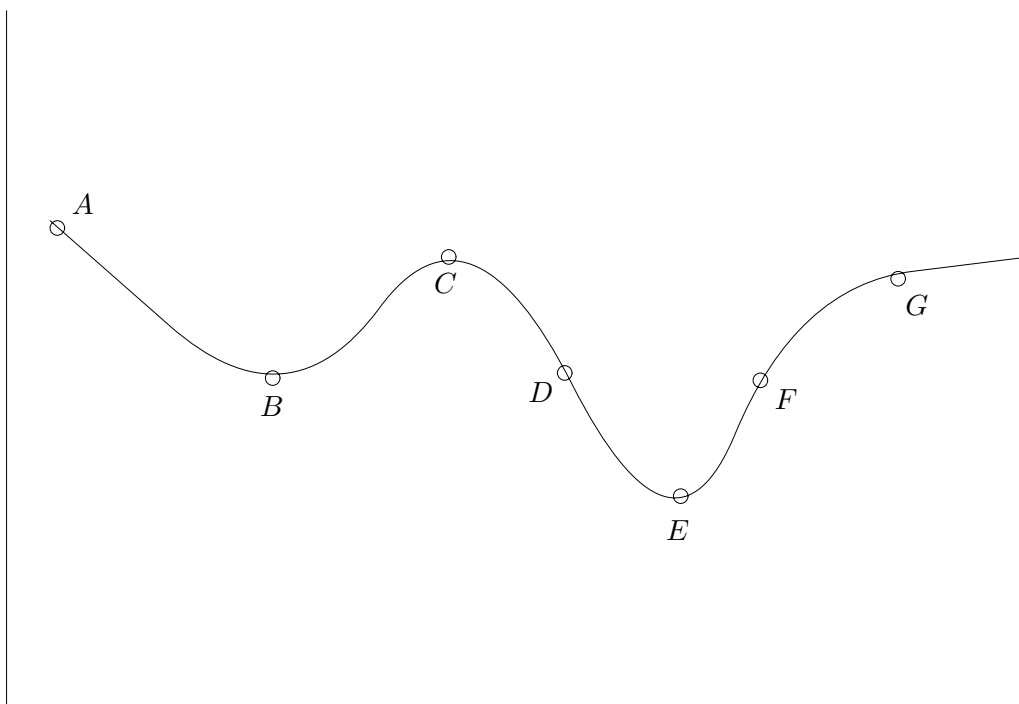
_____

(6) (15 points) \$500.00 is invested at 8% compounded continuously.
  (a) Give a formula for the value of the principle P after t.

_____

  (b) How long does it take the investment to double?

_____

  (c) What is the effective annual yield of the investment?

_____

(7) (10 Points) Let $y = f(x)$ have the following graph.

(a) For which of the labeled points is $f'(x) > 0$? _____

(b) For which of the labeled points is $f'(x) < 0$? _____

(c) For which of the labeled points is $f'(x) = 0$? _____

(d) At which of the labeled points is $f'(x)$ the largest? _____

(8) (10 points) Let $f(x) = 3x^2 + x$.

   (a) Simplify the expression $\dfrac{f(2+h) - f(2)}{h}$.

   (b) Use your answer to part (a) to find the instantaneous rate of change $f'(2)$.

$$f'(2) = \underline{\hspace{5cm}}$$

(9) (10 points) Let $f(x) = 2(1.3)^{2x}$.

   (a) What is the average rate of change of f on the interval from $x = 3$ to $x = 3.1$

$$\underline{\hspace{6cm}}$$

   (b) What is the average rate of change of f on the interval from $x = 3$ to $x = 3.01$

$$\underline{\hspace{6cm}}$$

   (c) What is a good estimate for the instantaneous rate of change of f at $x = 3$.

$$\underline{\hspace{6cm}}$$

(10) (10 points) The table below shows the w (in pounds) of a cat at age t (in weeks)

t	0	2	4	6	8
w	.32	.87	1.23	2.29	3.62

(a) What is the average rate of change in the weight of the cat between the 2nd and 6th week?

_____

(b) Estimate the instantaneous rate of change of the cat went it is 6 weeks old.

$$w'(6) = \underline{\hspace{3cm}}$$

(11) (5 points) Let $f(t) = 3\sqrt{t^2 + 5}$. Use your calculator to compute $f'(4.1)$ to 3 decimal places.

$$f'(4.1) = \underline{\hspace{3cm}}$$