# 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.) It warmed up throughout the morning, and then suddenly got much cooler around noon, when a Strom came thorough. After the storm it warmed up before cooling off at sunset. Sketch a possible graph of this day's temperature as a function of time. Label the axis and show where the storm started.

2. (10 Points) The following is a graph of P as function of r.
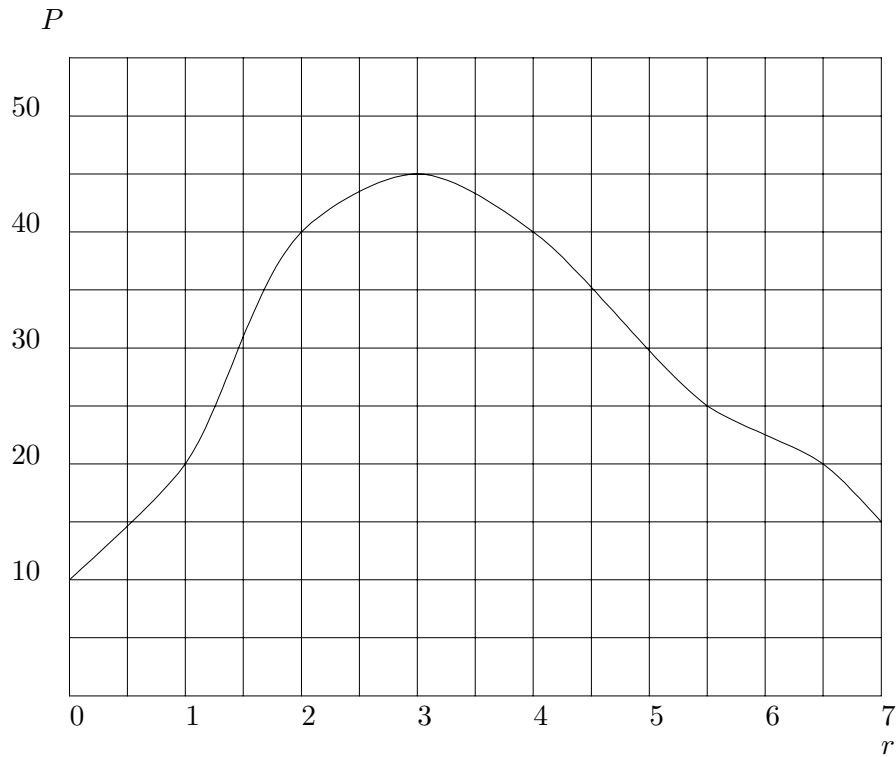
(a) What is the value of P when $r = 2$?

_____

(b) For what values of r is $P = 20$?
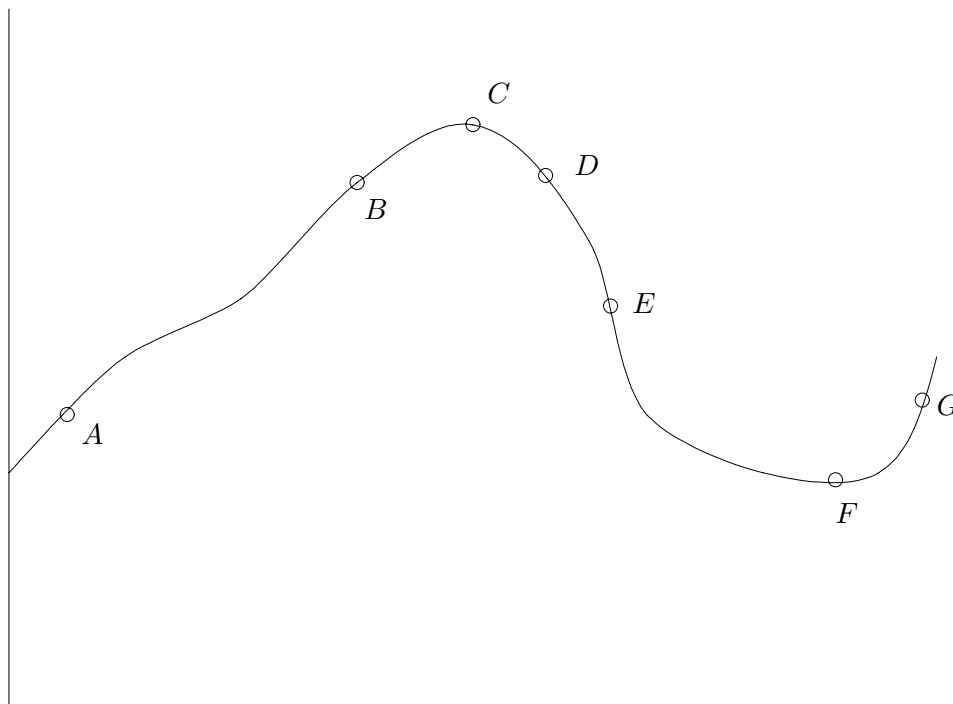
_____

(c) What is the average rate of change of P with respect to r between $r = 1$ and $r = 4$?

_____

(d) What it the value of the derivative $\dfrac{dP}{dr}$ when $r = 4.5$?

_____

(e) What is the largest that P becomes?

_____

(f) What value of r makes P the largest?

_____

3. (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?

_____

4. (10 Points) Let $f(x) = \dfrac{1 - 3^x}{2 + x^4}$.

(a) Compute the derivative $f'(2)$

_____

(b) What is the equation of the tangent line to $y = f(x)$ at the point where $x = 2$?

_____

5. (10 Points) Corresponding values of p and q are given by the table:

p	1	4	10	13
q	-2	2	10	14

Assuming that the relationship between p and q is linear answer the following:

(a) Find p as a linear function of q

_____

(b) Find the value of q when $p = 20$ $q=$ _____

6. (15 Points) One hundred guppies (at type of small but fast breeding fish) are released in Lake Murray. Assume the population of guppies increases by 40% per year.

    (a) How many guppies are there one year after the first 100 are released? _____

    (b) Give a formula for the number $G(t)$ of guppies t years after the first 100 were released.

$$G(t) = \underline{\hspace{3cm}}$$

    (c) How many guppies will there be 20 years after the first 100 were released?

_____

    (d) How long does it take for the number guppies to double?

_____

7. (15 Points) The following table gives the some of the values of an exponential function $P = P(t)$.

t	0	1	2	3	4	5
$P(t)$	14.000	11.900	10.115	8.5978	7.308	6.2112

(a) What is the factor by which $P(t)$ changes when t is increased by 1?

_____

(b) What is a formula for $P(t)$ as a function of t?

$$P(t) = \underline{\hspace{4cm}}$$

(c) What is the value of $P(t)$ when $t = 10$?

$$P(10) = \underline{\hspace{4cm}}$$

8. (15 Points) Let the function $u = f(t)$ have its values as in the following table:

t	0.0	0.2	0.4	0.6	0.8
$f(t)$	0.192	0.345	0.441	.488	.543

(a) What is an estimate for $f'(0.6)$? _____

(b) What is the equation of the tangent line to the graph when $t = .6$? _____

(c) What is a good estimate for $f(.586)$? _____

9. (5 Points) Explain in a few sentences what the derivative is.