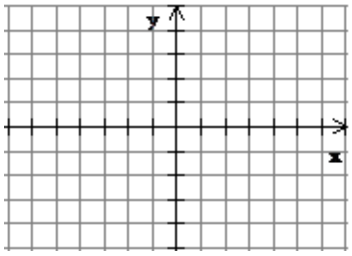
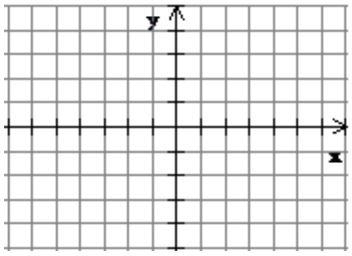
Math 261 - Lab 4 **Rates of Change** **Name:** _____

1. Graph the rate of change for each function.

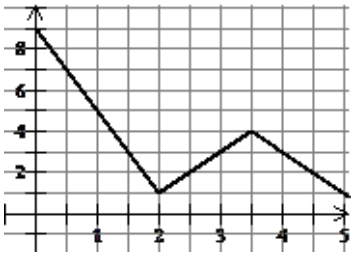
(a) Distance a snail moved in cm as a function of time in hrs.

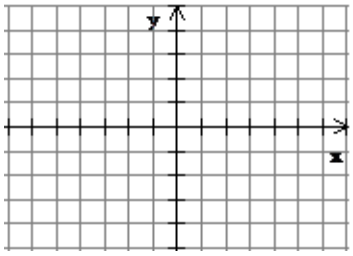


(b) Water depth in inches as a function of time in minutes.



(c) Money in millions of $ as a function of time in months.





2. (a) Find the average rate of change of the function $f(x) = x^2 - 1$ over the interval $[0, 2]$

(b) Find the average rate of change of the function $G(t) = \sqrt{2x + 3}$ over the interval $[-1, 3]$.

3. (a) Find the slope of the curve $h(x) = x^2 - 2x + 1$ at the point $P(2, 1)$.

(b) Find the equation to the tangent line to h at P.

4. Let $f(t) = \dfrac{1}{t-1}$ for $t \neq 1$

(a) Find the average rate of change of f with respect to t interval (i) $[2, 3]$ and (ii) in general for intervals of the form $[2, T]$. For (ii), be sure to simplify your answer as much as possible.

(b) Fill in the table below to compute the average rate of change of $f(t)$ over the interval $[2, T]$ for the values $T = 2.5, 2.1, 2.01, 2.001, 2.0001$, and 2.00001.

T	2.5	2.1	2.01	2.001	2.0001	2.00001
$f(T) = \frac{1}{T-1}$						
$f(T) - f(2) = \frac{1}{T-1} - 1$						
Avg. Rate of Change						

(c) Based on the information in your table, make a conjecture about the value of the instantaneous rate of change of f with respect to t when $t = 2$.

(d) Look back at your algebraically simplifiedanswer to 4(a) part (ii) above. If you simplified completely and correctly, you should be able to substitute $T = 2$ into the expression. What do you get when you do so?

(e) How does the value you get by substituting in $t = 2$ compare to your conjecture based on the information in the table above?