Name: _____ **TC**

Classwork 28

1. a. Let $f(x) = 3x - 5$. Find $f(7)$.

b. Let $f(x) = 3x - 5$. Find $f(x + h)$.

c. Let $f(x) = x(x - 1)$. Find $f(3 + h)$

2. Let's say we are dealing with the graph of $f(x) = x^2$

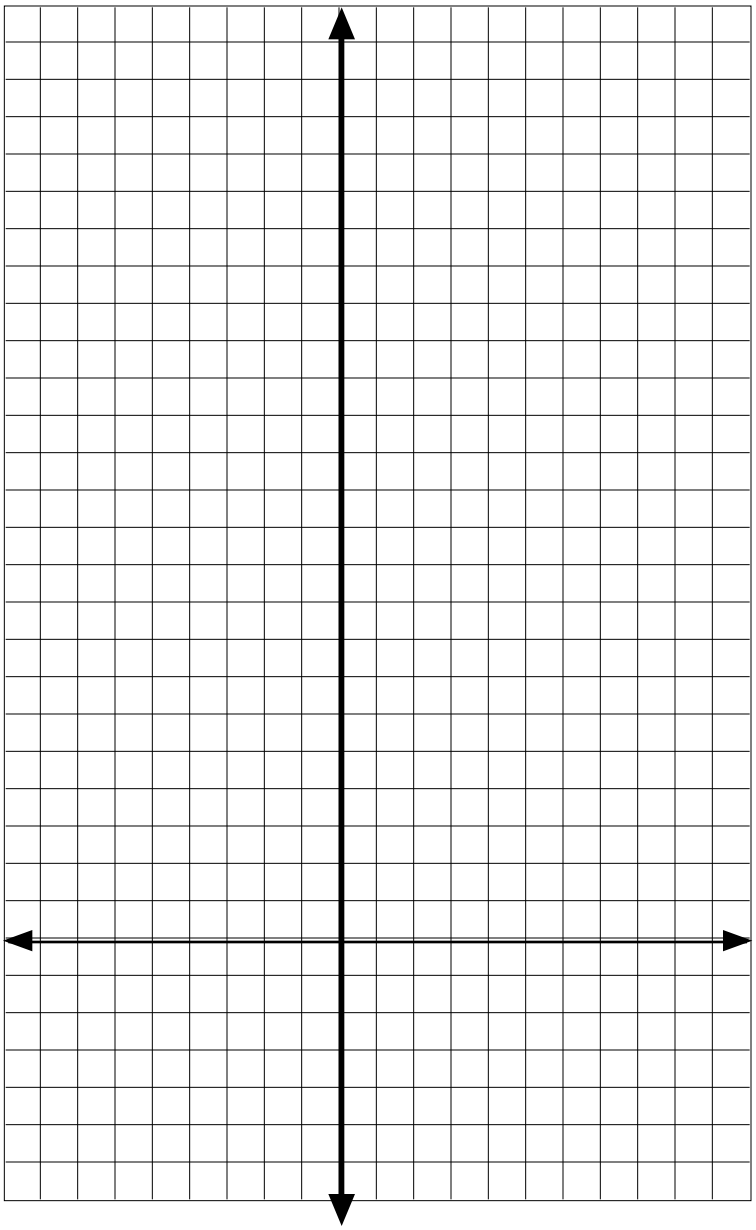
a) Investigate the slope around $x = 5$ using the chart. This time, however, Δx is given.

First point		Second point		Δx **"h"**	$\Delta f(x)$	slope
3				.5		
				.1		
				.05		
				.01		
				.001		
So in general, in terms of only **x** , **h**, and **f(x)....** **(A)** **(B)** **(C)** **(D)** **(E)** **(F)** **(G)**						
x						
First point		Second point		Δx **"h"**	$\Delta f(x)$	slope

c) Write a limit to express the exact slope at a point **x.**

d) Could we manipulate the limit to get the right answer for $x = 3$?

3. a) Graph $y = x^2$ on the graph below and fill out the table.



x	x^2	

x	$x^2 + 2x - 6$	

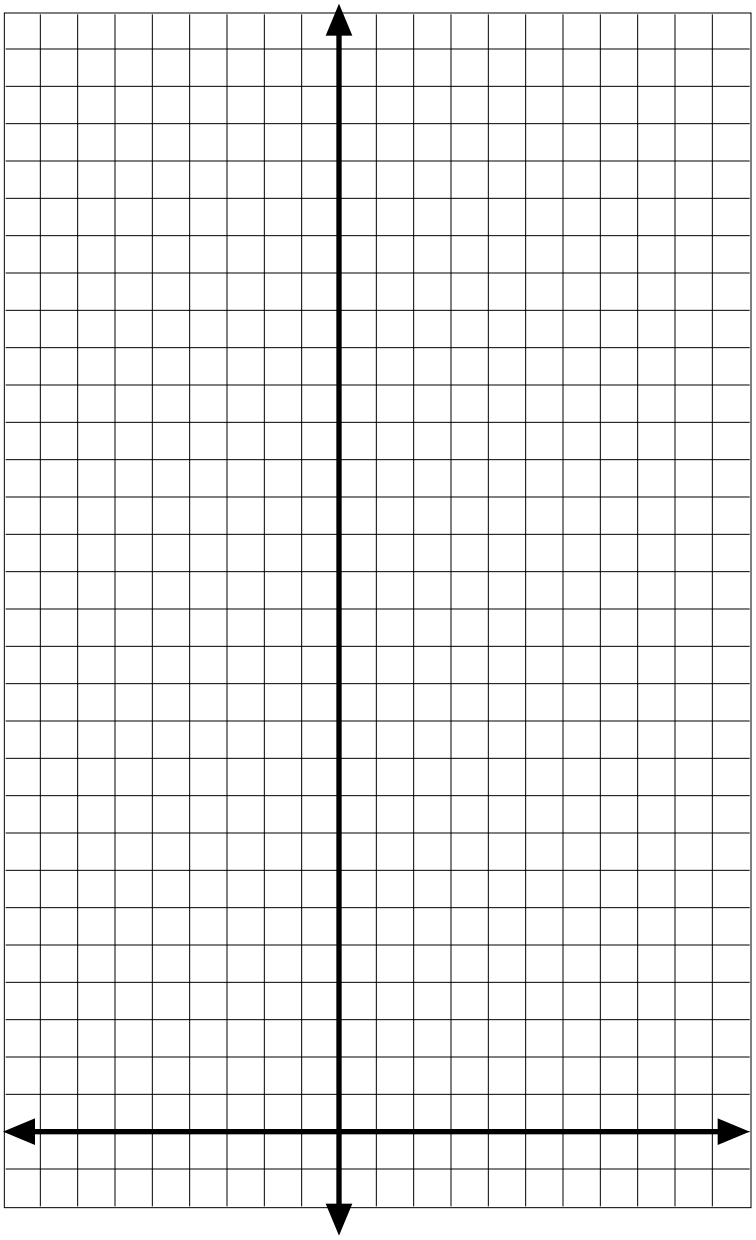
b) How much does y increase by every time x goes up by 1?

c) Write a formula for that increase.

d) Let the first y value be x_1. Prove your regularity mathematically.

e) Use the second chart for the function $y = x^2 + 2x - 6$ and then **graph it on the same axes.** Does the same pattern hold?

4. a) Graph $y = 2x^2$ and $y = 2x^2 - 4x + 1$ on the graph below.



b) How much does y increase every time x increases by 1?

c) Prove mathematically that this regularity is true.

d) What pattern do you predict for parabolas that start with $3x^2$?

e) What pattern do you predict for $\mathbf{c}x^2$? Can you prove it?

f) Discuss how slope changes as x changes in a parabola.

Practice Problems

1. Evaluate each expression for $f(x) = \sqrt{x} - x$

a) $f(4)$ b) $f(m)$ c) $f(4x^2)$ d) $f(x + h)$

2. Write, but do not solve or simplify, **a derivative limit** to find the slope at a point under each condition:

a) $f(x) = \sin x$ at $x = 2$

b) $f(x) = 3x + 7$ at $x = 1$

c) $f(x) = x^2 - x$ at $x = 3$

d) $f(m) = \log m$ in general for any value of x.