Name: _____ **TC**

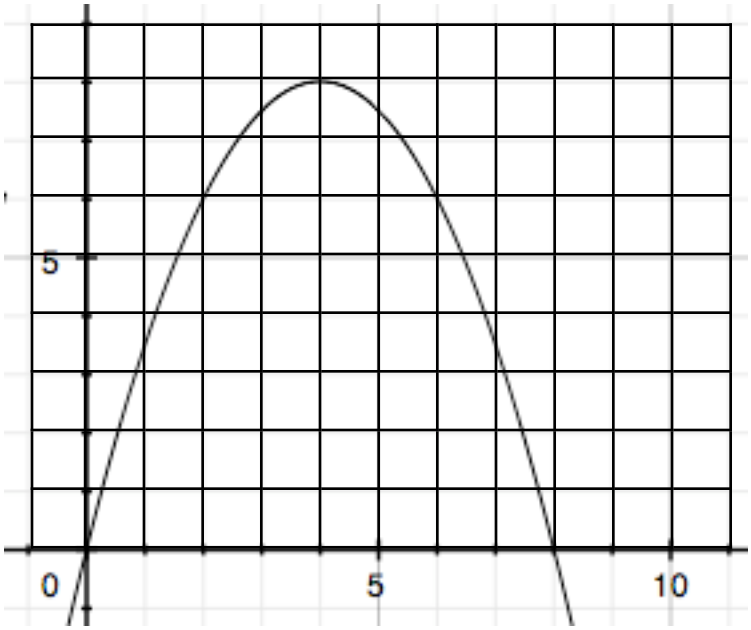
Classwork 22

1. Write the formula for average speed

2. What is the difference between average speed and instantaneous speed?

3. Roy vaulted off of a cliff while biking around Brooklyn. His position over time is described by the equation

$y = -1/2x^2 + 4x$



a) Find the average speed over each interval.

i. 0 hours to 6 hours

ii. 1 hour to 5 hours

iii. 2 hours to 4 hours

iv. 2.5 hours to 3.5 hours
(hint: use the equation, not the graph)

v. 2.8 hours to 3.2 hours

vi. 2.9 hours to 3.1 hours

vii. 2.95 hours to 3.05 hours

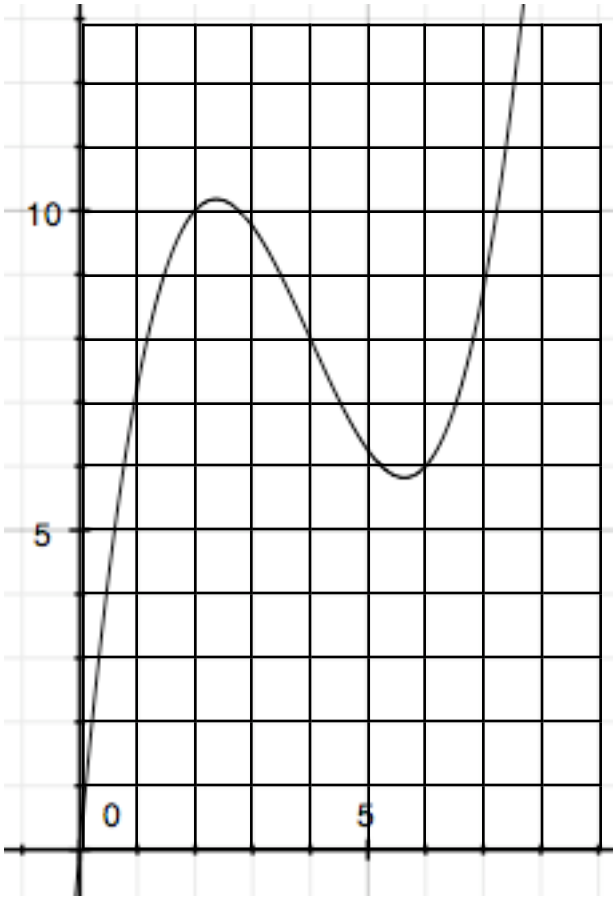
viii. 2.999 hours to 3.001 hours

b) What do you predict for the **instantaneous speed** at 3 hours?

c) Find the instantaneous speed at 3 hours using the graph.

d) Write a **limit expression** for the instantaneous speed.

4. The relationship between time and how much snow is on the ground is described by
$y = 1/4x^3 - 3x^2 + 10x$



a) When is the snow falling fastest?

b) When does the snow start to melt?

c) Find the average rate of snowfall for each interval.
i. 6 hours to 8 hours

ii. 6.5 hours to 7.5 hours

iii. 6.9 hours to 7.1 hours

iv. 6.99 hours to 7.01 hours

e) Estimate the instantaneous rate of snowfall at 7 hours.

f) Write a limit expression for the instantaneous rate of snowfall at 7 hours.

g). Suppose after 7 hours the snow simply continues accumulating at the same rate for the next hour. In New York city, 17 inches must be on the ground for the city to close school. Will there be enough snow for a snow day?

5. Let $f(x) = \sin x$.

a) Use the chart below to find the **exact** slope at x = 0.

		Second Point			
First point (x, f(x))	**h (Δx)**	**x_2**	**$f(x_2)$**	**Δy**	**Slope**
(0, 0)	1				
(0, 0)	.5				
(0, 0)	.1				
(0, 0)	.01				
(0, 0)	.001				
(0, 0)	.0001				

b) What is **h** approaching?

c) How did you calculate $\mathbf{x_2}$?

d) How did you calculate $\mathbf{f(x_2)}$?

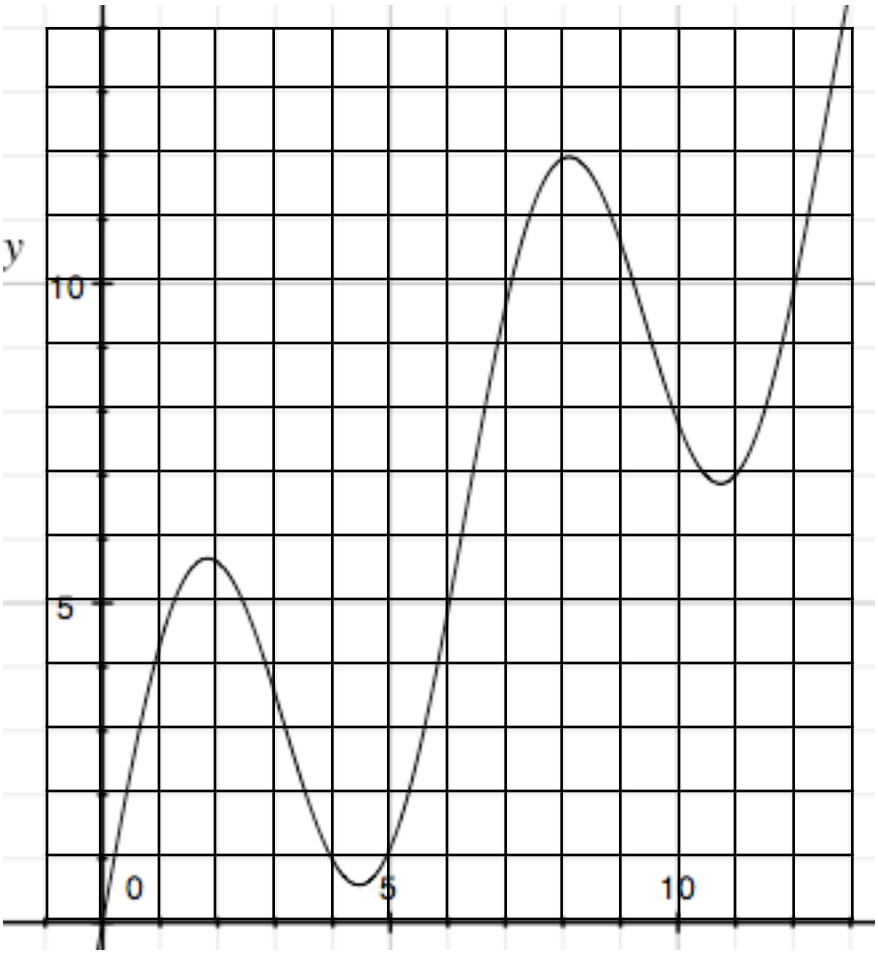
e) How did you calculate **Δy** ?

f) How did you calculate **slope** ?

g) Write a limit for the slope at a point using only **x** and **h** as variables.

Practice Problem

1. Use the graph of $y = x + 4 \sin x$ below to answer the following questions.



a) Use the graph to approximate the slope of the graph at x = 5.

b) Find the average slope between x = 5 and a point very close to it.

c) Why do we have to use calculus to find the exact slope at x = 5?