Name: _____ **TC**

Classwork 30

Picking up where we left off....

1. A bird is accelerating upwards. The displacement of the bird over time is described by $y = x^2$.

Reminder: On Friday, we proved that under constant acceleration, the average speed over any time interval was equal to the **instantaneous speed** at exactly the middle of the time period.

a) Find the average speed of the bird between 5 seconds and 10 seconds.

b) At what time is the bird travelling exactly the speed in (a)?

d) Given that the average speed occurs at the midpoint of the time interval, fill out this chart with the interval, the average speed, and the time at which it occurs. **(Using what we did on Friday)**

interval	average speed	time at which it occurs	
0 - 2 s			
2 - 4 s			
4 - 6 s			
6 - 8 s			
8 - 10 s			
10 -12 s			

e) Write a general rule for the relationship between the instantaneous speed and the time at which it occurs.

f) How could we write a **limit expression** for the instantaneous speed (slope at the point) for any value x? Remember, we want the change in x to approach zero....

First point: Second point: Slope:

g) Use this expression to find the exact slope at exactly x = 10 and x = -10.

h) This limit is called the **derivative.** The derivative is a function that gives you the slope at any point if you input its x-value. Find the derivative for $y = x^3$

i) Use this expression to find out when the slope of the curve equals 1.

j) Find the derivative for $y = x^4$.

k) Find the derivative for $y = 2x^2$.

l) Find the derivative for $y = 3x^2$.

m) Why could you predict the answers to k & l ? (Think of the charts we did the other day).

Practice Problems

1. Find the derivative of $y = 2x$. (Why do you know this answer already?)

2. Find the derivative of $y = 4x^2$.

3. Find the derivative of $y = x^5$.