Name: _____ **AP**

Classwork 19

Warm up and review

1. Find $\lim_{x \to \infty} \frac{3x^4 - 2x^2 + x - 5}{5x^4 - 3x + 1/x}$

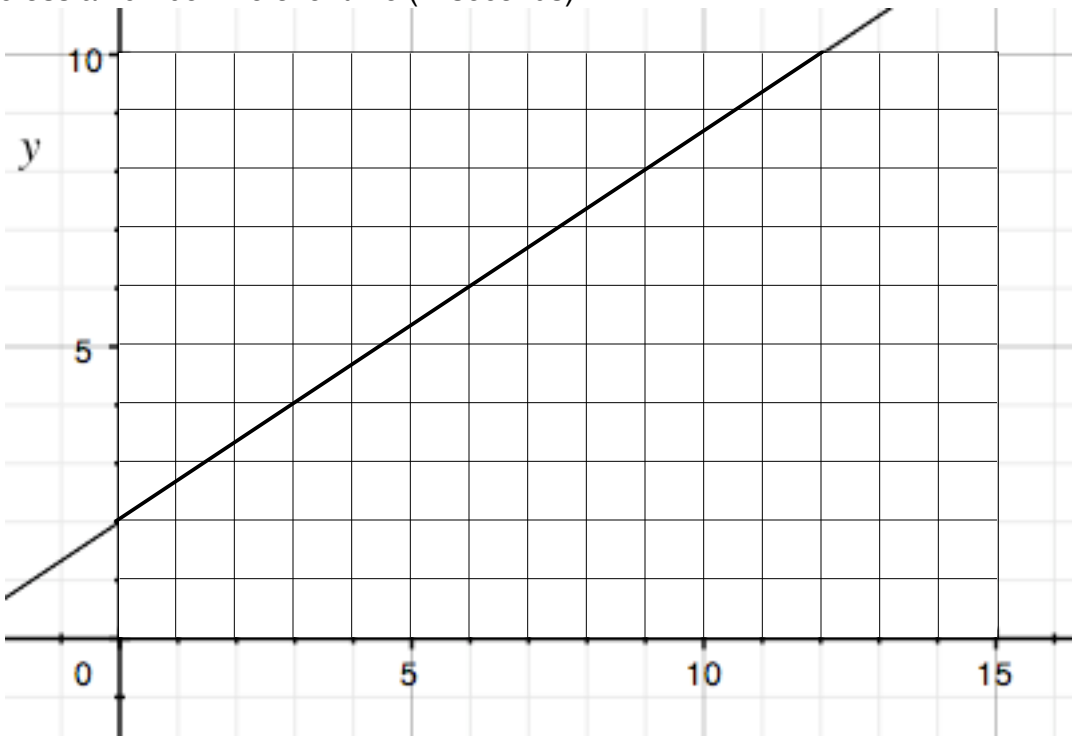
2. Lily climbs 25 stairs in 2 minutes. Find her speed in stairs per minute.

3. At 11:15, Jose is 20 feet away from the lunch counter. At 11:18, Jose is still 5 feet away from the lunch counter. What was his average speed during that time period?

4. Find the limit of

$$\sqrt{56 + \sqrt{56 + \sqrt{56 + \sqrt{56 \ldots}}}}$$

5. Use the graph below to answer the questions. It shows the position (in inches) of a penny sliding across a number line over time (in seconds).



a) Find the penny's position at each time.

i. 3 seconds ii. 9 seconds iii. 12 seconds iv. 0 seconds

b) Find the penny's speed.

c) Find the penny's speed at exactly 9 seconds.

d) Why can't you answer (c) by doing s = d/t = 8 inches/9 seconds = .8888... in/s ?

Picking up where we left off...

6. Imagine that we had an equation to describe the motion of a fly buzzing around someone else's hot, stuffy classroom. The equation is

$$d = \frac{1}{8}t^4 - \frac{1}{2}t^3 - t^2 + t + 12$$

a) Zoom in to precisely x = 2. In order to make this work, you should trace along the graph until you get as close as possible to x = 2. Then press "Zoom"/ "Zoom In". Now trace again until you get as close as possible to x = 2. Zoom in again. Repeat this process several times. What happens?

b) Go back to Y= and enter the graph y = -5x+ 18 into Y2. Graph both of the functions at the same time **without changing your zoom**. What do you see?

g) What would you say is the **slope of the graph AT x = 2?**

h) Now zoom out. What do you see now?
Use **WINDOW: x min = 1 x max = 5 y min = -1 y max = 12**

i) Zoom in to x = 0 now using the same "Trace, zoom, trace, zoom" process.

j) Graph the line y = x + 12 in Y3 without deleting any of the other functions. Now graph again, staying zoomed in to x = 0. What do you see?

k) What would you say is the **slope of the graph AT x = 0?**

l) Zoom out. What do you see now?
Use **WINDOW: x min = -2 x max = 2 y min = 10 y max = 14**

m) Let's do one more. Zoom into x = 4.

n) Now enter into Y4 y = x - 4. Go back to your zoom. What do you notice?

o) What would you say is the **slope of the graph AT x = 4?**

p) Zoom out. What do you notice?

q) Describe the relationship between the straight lines and the curve. What is the mathematical name for their relationship?

r) Let's say that y is in meters and x is in seconds. Based on what you just did, find the **instantaneous speed** of the fly at :

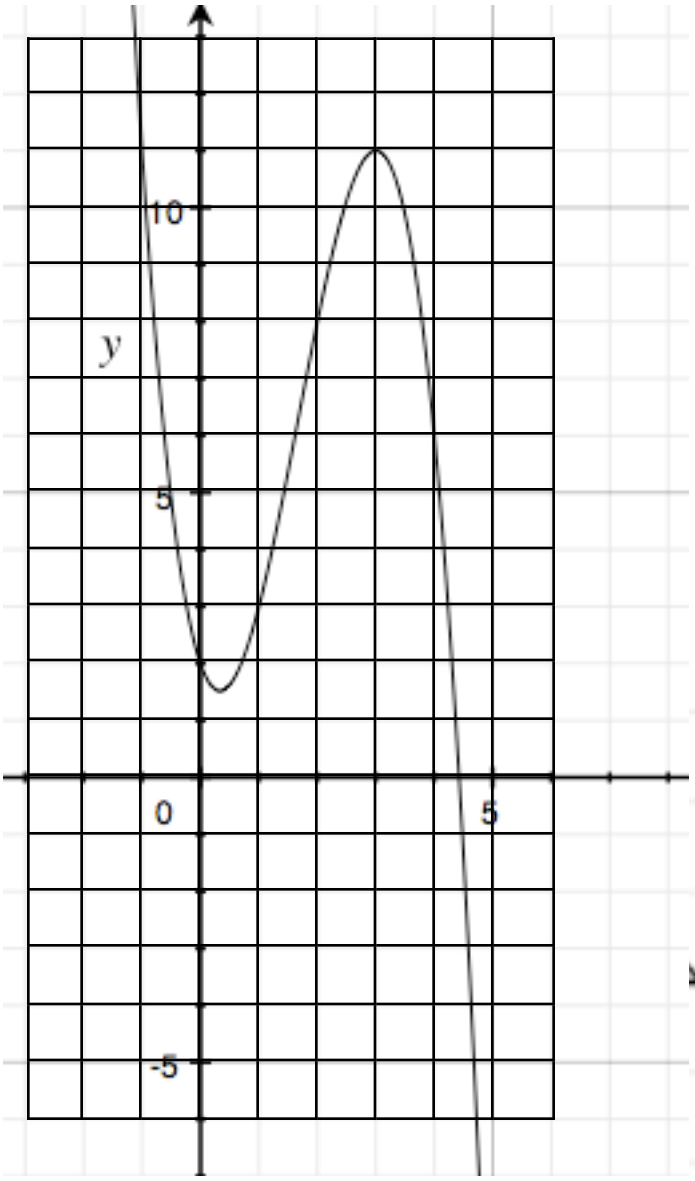
i) t = 2 ii) t = 0 iii) t = 4

7. You are given the graph of a function (below) of an object moving over time.

a) Draw a line on the graph below to approximate the slope at the point where x = 0

b) What is the intercept of that line?

c) What is the slope of that line?



d) The curve's equation is

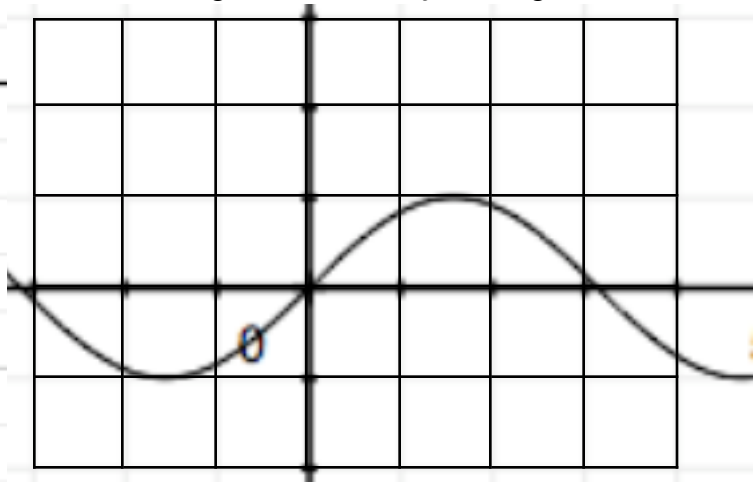
Enter this into Y1.

Now enter the equation of your tangent line into Y2.

Zoom into x = 0 to see if the slope you approximated is close.

4. a)Find the slope of the curve in the 2nd graph when x = 0.

b) Check your answer by graphing the original curve and your tangent line.



Practice Problem

1. The distance travelled by a bird over time is described by $y = 1/2x^2 - 3x$. Y represents distance in miles and x represents time in hours.

a) Make a graph of the position of the bird over time.

b) Calculate the average speed using intervals near $x = 4$.

c) What is the instantaneous speed at $x = 4$?

d) Show on the graph how you could find instantaneous speed.