

3.3 Graphs and Secant Lines

Objective:

Find the equation of a line secant to a polynomial function and the average rate of change of a function between the two points.

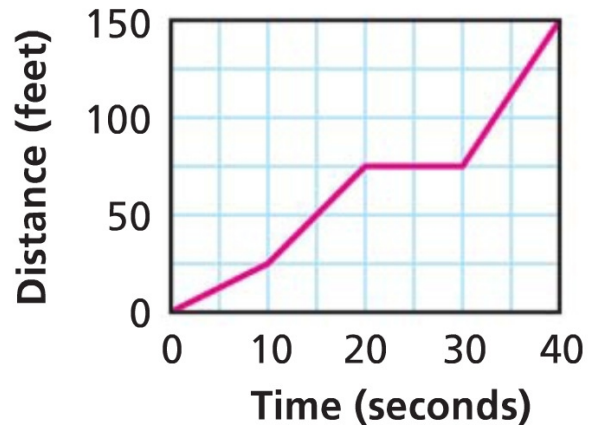
Big IDEAS:

Slope is a **rate of change** and can be expressed in many different ways.

$$\text{Slope} = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{f(b) - f(a)}{b - a}$$

The graph at the right shows the distance traveled by a runner over a 40 second span.

1. Find the slope of the interval from 0 to 10 seconds.
2. What does this slope represent in relation to the runner?



Not every distance vs. time graph will be composed of straight lines. Use Geogebra to develop a method that can be used to estimate the slope of a curve. Go to the Advanced Math Webpage to download a preexisting Geogebra lesson found under Friday's lesson plan.

3. Determine the slope between the two points A and B listed on the graph. Show work.

Now zoom out until you see the x and y axes. The graph you are viewing represents the height of an object that is dropped from 80 feet from above the ground in relation to time in seconds. **Move points A and B to new locations.**

4. Write their new coordinate pairs below. Then find the slope. Show work and labels!
5. Compare your answers from question 3 and 4. Are they the same? What does this tell you about the object as it is falling?

6. At approximately what time will the object hit the ground? Explain your reasoning as to how you obtained this response.

7. Estimate the speed of the falling object when it hits the ground. Explain how you determined your answer.

Select the tool menu option that allows you to construct lines. Construct a line between points A and B. Then move both points as close to the point (0,80) as possible without causing the line to disappear.

8. Estimate the slope of the line. What does this tell us in relationship to the object's velocity at time $t = 0$?

9. Aaron would like to estimate the velocity at $t=1$ second. Describe what you believe would be the most effective method to do this using the Geogebra program. Then state what you believe the velocity will be at $t=1$.