

RELATING GRAPH OF A FUNCTION TO DERIVATIVES

OBJ: Students will be lead to discover the relationship between the graph of a function and the graph of the first derivative and/or the graph of the second derivative.

STUDENTS WILL BE ABLE TO:

- Draw a graph of a function, first derivative, or second derivative given any one of the three as a starting graph.
- Acknowledge that the first derivative graph represents the slope at any and all points of the given function.
- Acknowledge that the second derivative graph represents the concavity at any and all points of the given function.
- Determine critical points and points of inflection of a given graph of a function.
- Relate an increasing interval on a graph of a function to positive y values on a derivative graph and vice versa.
- Relate a decreasing interval on a graph of a function to negative y values on a derivative graph and vice versa.
- Relate an interval where concavity is up on the graph of a function to positive y values on a second derivative graph and vice versa.
- Relate an interval where concavity is down on the graph of a function to negative y values on the second derivative graph and vice versa.
- Acknowledge that the x values of maximums and minimums are critical points and zeros (x -intercepts) on the first derivative graph.
- Acknowledge that points of inflection are the x values of the maximum and minimums on the first derivative graph and the zeros on the second derivative graph as well as the change in concavity of the given function.

PRIOR KNOWLEDGE

- Students need to be able to graph functions.
- Students need to understand the following with regard to graphs: maximums, minimums, increasing, decreasing, solutions (zeros), concave up, and concave down.
- Recognize the general characteristics of parent functions.

ESSENTIAL QUESTIONS

- Where on a graph does a function increase and/or decrease?
- Where on a graph does a function illustrate concavity that is up or that is down?
- Where does the concavity change from concave up to down on a graph?
- What is the relationship between the graph of a function and the graph of its derivative?
- What is the relationship between the graph of a function and the graph of its second derivative?

USING TI-INTERACT Thoughts and considerations:

- One might consider clicking on the graph and only graphing two functions at a time.
(Function and its derivative, function and second derivative, first and second derivative).
- The assessment questions are based on graphing the first derivative only and then determining the function and second derivative graphs. One may wish to change the graph to a function or second derivative but the questions will then have to also be changed.
- Scroll bars to change the coefficients of the parent cubic function are only for convenience. One might consider clicking on the functions below the graph and select hide the input thereby putting student focus on the graphs.
- An extension to this lesson might be a discussion regarding position, velocity, and acceleration.