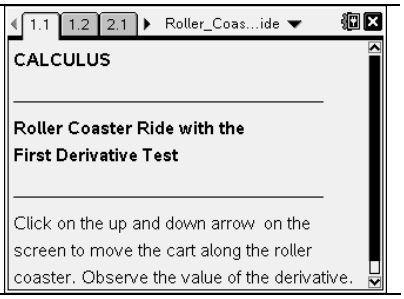
Roller Coaster Ride

STUDENT ACTIVITY

In this activity, you will expand on your understanding of the first derivative test. You will explore the path and slope of a roller coaster car along the track.



- **Open the TI-Nspire document *Roller_Coaster_Ride*.**
- **Press ctrl ▶ and move to page 1.2 to begin the lesson.**

1. The graph on page 1.2 represents a roller coaster at a state park. The polygon located at x = 0 represents the roller coaster car. The *x*-value and the slope of the tangent line (the first derivative, f'(x)) are calculated for each point on the curve.

   a) Click on the up or down arrow on the screen to move the car along the roller coaster and identify all the critical points.

   _____

   b) List the critical points, explain why each of the points is a critical point, and use the first derivative test to prove the point is a local maximum, local minimum, or neither. Imagine you are on the roller coaster. What happens on the ride at each critical point?

Critical point	***Reason why it is a critical point***	***Use the first derivative test to prove the critical point is a local maximum, local minimum, or neither.***	***Describe the ride at the critical point.***

c) Complete the definition of the ***first derivative test*** below:

Suppose f is continuous at the critical point a:

- *If the first derivative f' changes sign from _____ to _____ at a, then f(a) is*

_____

- *If the first derivative f' changes sign from _____ to _____ at a, then f(a) is*

_____

- *If the first derivative f' does not change sign at a, then f has*

_____

Move to page 2.1.

2. a) Find the derivative function $f'(x)$ for the function $f(x) = (x - 2)(x + 5)(x - 3)$.

$f'(x) =$ _____

b) Fill in the table below for the given values of x.

x	***f'(x)***
–3	
–2	
–1	
0	
1	
2	
3	

c) Using the information from the table, speculate about the location of any local maxima or minima. Where are the local extrema?

_____

_____

d) Graph the function $f(x) = (x - 2)(x + 5)(x - 3)$ on page 2.1 to verify your answers above.