AP Calculus – Mixed Six – Using Technology Calculator-Active

Connecting a Function, Its First Derivative, and Its Second Derivative (Topic 5.9)

1. Factual Recall

The function *f* has first derivative given by $f'(x) = x^4 - 3x^2 + 2x - 1$. Use the graph of the derivative to determine the intervals on the graph of *f* is decreasing.

2. Carry out a Procedure

Use the graph of $f'(x)$ given in #1 to find the *x*-coordinate of the relative maximum and the relative minimum of the function *f*.

3. Classify a Mathematical Object

The first derivative of a function *f* is defined by $f'(x) = \left(\frac{x^2+1}{3}\right)\cos(2x-1)$ for $-2.5 \le x \le 2.5$.

Various values of *x* are given below. Classify each as the location of a relative minimum, a relative maximum, a point of inflection on the graph of *f*, or none of these.

x	Classify
–1.856	
–1.285	
–0.762	
–0.285	
0.722	
1.285	
1.681	
2.249	

4. Prove, Show, Justify

The function *h* has first derivative given by $h'(x) = \frac{x^3 - 7x^2 + 3}{\sqrt{x^3 + 4x + 6}}$. At what values of *x* does the graph of *h* have points of inflection? Give a reason for your answer.

5. Extend a Concept

The first derivative of a function *g* is defined by $g'(x) = x^2\left(\sin^{-1}(0.6x + 0.5) + 1\right)$.

On what open interval is the graph of *g* increasing and concave down?

6. Critique a Fallacy

The second derivative of a function *h* is defined by $h''(x) = \frac{7(x-1.2)}{x^2+5}$. Paige says that the graph of *h* has points of inflection at $x = -1.338$ and $x = 3.738$ because the graph of $h''(x)$ changes from increasing to decreasing or vice versa. Do you agree or disagree? Why?

Vicki Carter, Retired from West Florence HS, Florence, SC