**Math Xa** **Fall 2001**

## Homework Assignment 23: Due at the beginning of class 12/5/01

Figures 1 and 2 show the graphs of the derivative and the second derivative of a function, *f*. Questions 1 and 2 use these graphs.

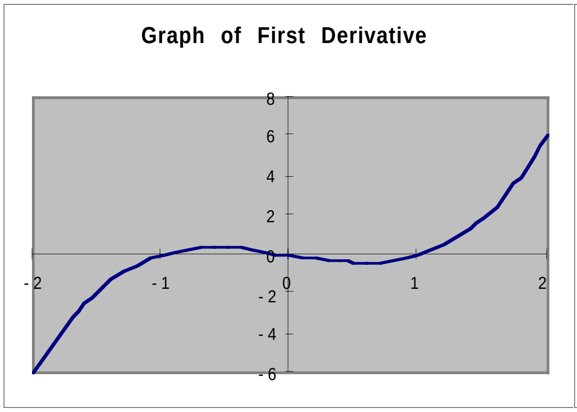


Figure 1: Graph of first derivative.

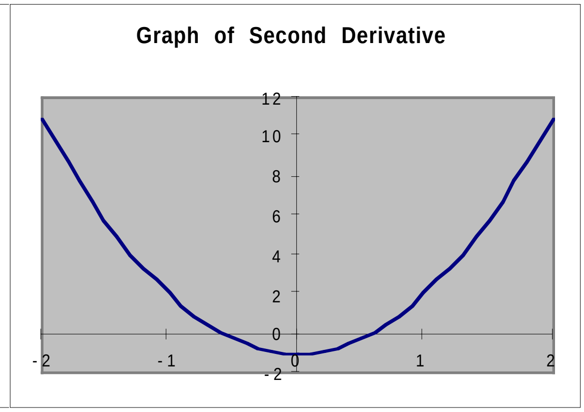


Figure 2: Graph of second derivative.

**1.** Locate the $x$-coordinates of any critical points of the function $f$. Use the information provided by Figure 2 to classify the critical points of $f$ as local maximums, local minimums or neither.

**Note:** As part of your answer, you should say what information you are using from Figure 2 and how you are interpreting that information.

**2.** Locate the $x$-coordinates of any inflection points of the function $f$. Explain how you can tell that the points you have identified truly are inflection points, rather than just points where the second derivative is zero but the concavity of the original function does not change.

In Problems 3 and 4, $f(x)$ and $g(x)$ are functions that have derivatives. All that you can assume about them is

- $f'(2) = 7$
- $f(2) = 2$
- $g'(2) = -4$
- $g(2) = 18$.

Use the information given about $f(x)$ and $g(x)$ to calculate the derivatives of the functions defined in problems 3 and 4.

**3.** $j'(2)$, where $j(x) = [f(x) + g(x)]^4$.

**4.** $m'(2)$, where $m(x) = g(x) \cdot \ln(f(x))$.

**5.** Sketch a graph of a single function, $f(x)$, that has all of the following features:

- When $x < 2$, $f'(x) > 0$.
- When $2 < x < 4$, $f'(x) < 0$.
- When $x > 4$, $f'(x) > 0$.
- When $x < 3$, $f''(x) < 0$.
- When $3 < x < 5$, $f''(x) > 0$.
- When $x > 5$, $f''(x) < 0$.
- $f(0) = 4$.

**NOTE:** You do *not* need to come up with an equation for $f(x)$, all you need to do is produce a graph of $y = f(x)$ that shows all of the features listed above.