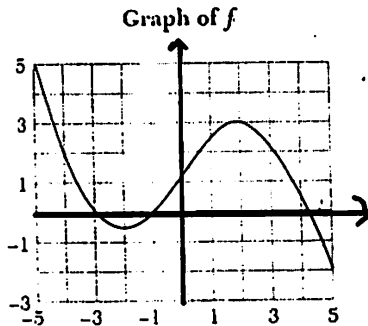


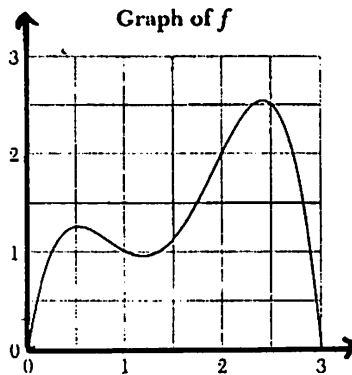
# Second Derivative Exercises

## BASICS

1. The graph of a function  $f$  appears below.



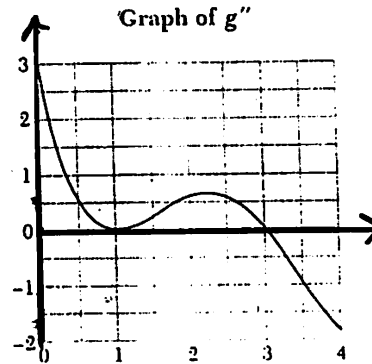
- (a) For which values of  $x$ , if any, is  $f''(x)$  negative? Positive? Zero?
- (b) Rank the four numbers  $f'(0)$ ,  $f(2)$ ,  $f'(2)$ , and  $f''(2)$  in increasing order.
2. The graph of a function  $f$  appears ~~below~~ <sup>on the right</sup>. [NOTE:  $f$  has points of inflection near  $x = 0.82$  and near  $x = 1.93$ ;  $f$  has stationary points near  $x = 0.52$ ,  $x = 1.19$ , and  $x = 2.42$ .]



- (a) Where is  $f''$  positive? Negative? Zero?
- (b) Rank the four values  $0$ ,  $f''(0.5)$ ,  $f''(1.2)$ , and  $f''(2.4)$  in increasing order.

## FURTHER EXERCISES

4. The graph of the second derivative of a function  $g$  is shown below. Use this graph to answer the following questions about  $g$  and  $g'$ .



- (a) Where is  $g$  concave up?
- (b) Where does  $g$  have points of inflection?
- (c) Rank the four numbers  $g'(0)$ ,  $g'(1)$ ,  $g'(2)$ , and  $g'(3)$  in increasing order.
- (d) Suppose that  $g'(0) = 0$ . Is  $g$  increasing or decreasing at  $x = 2$ ? Justify your answer.
6. In the left-hand column below are graphs of several functions. In the right-hand column—in a different order—are graphs of the *second* derivatives of these functions. Match each function with its second derivative function. [NOTE: The scales on the graphs are not all the same.]

