CONCLUSIONS ABOUT FUNCTIONS FROM THEIR DERIVATIVES

1. If $f'(x) > 0$ on the interval (a,b), then the function is increasing on (a,b).
2. If $f'(x) < 0$ on the interval (a,b), then the function is decreasing on (a,b).
3. If $f''(x) < 0$ on the interval (a,b), then the function is concave down on (a,b).
4. If $f''(x) > 0$ on the interval (a,b), then the function is concave up on (a,b).

A **critical point** is defined as a point on the graph where the derivative is either equal to zero or does not exist.

If $f'(x)$ changes from positive to negative around a critical point c, then there is a **relative maximum** point at $x = c$.

If $f'(x)$ changes from negative to positive around a critical point c, then there is a **relative minimum** point at $x = c$.

A **point of inflection** is a point on the graph where either $f''(x) = 0$ or does not exist, **and** there is a change of concavity at that point.

Do Now: #1

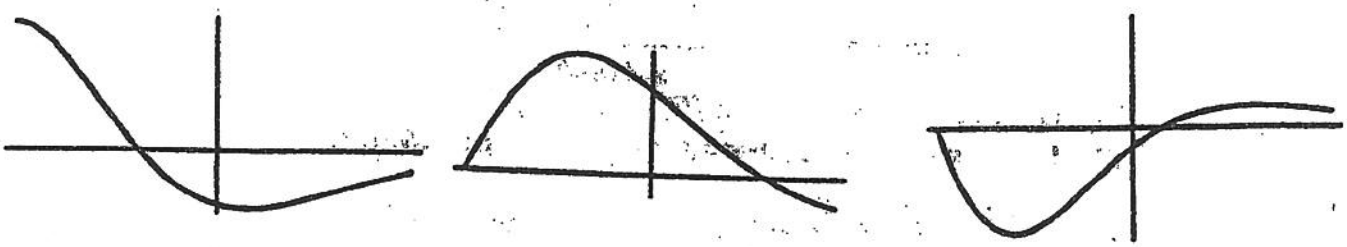
Name: _____ Date: _____

AP Calculus AB Using Graphs of Derivatives

1.

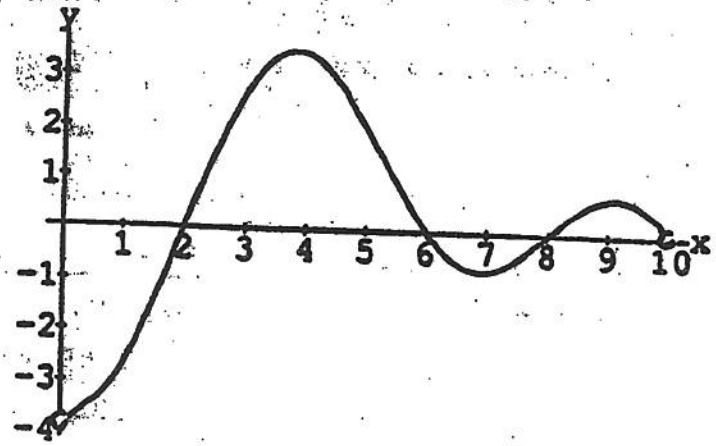
The graphs (i), (ii), and (iii) given below are the graphs of a function f and its first two derivatives f' and f'' (though not necessarily in that order). Identify which of these graphs is the graph of f, which is that of f' and which is that of f''. Justify your answer.

(i) (ii) (iii)



2.

The graph below is the graph of the *derivative* of a function f. Use this graph to answer the following questions about f on the interval $(0, 10)$. In each case be sure to justify your answer.



a. On what subinterval(s) is f increasing?

b. On what subinterval(s) is f decreasing?

c. Find the x-coordinates of all relative minima of f.

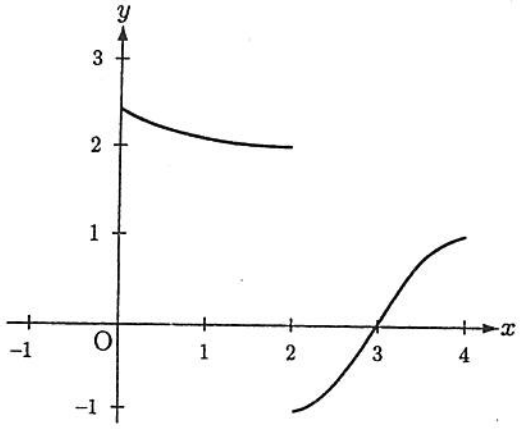
d. Find the x-coordinates of all relative maxima of f

e. On what subinterval(s) is f concave up?

f. On what subinterval(s) is f concave down?

g. Find the x-coordinates of all points of inflection of f.

3.



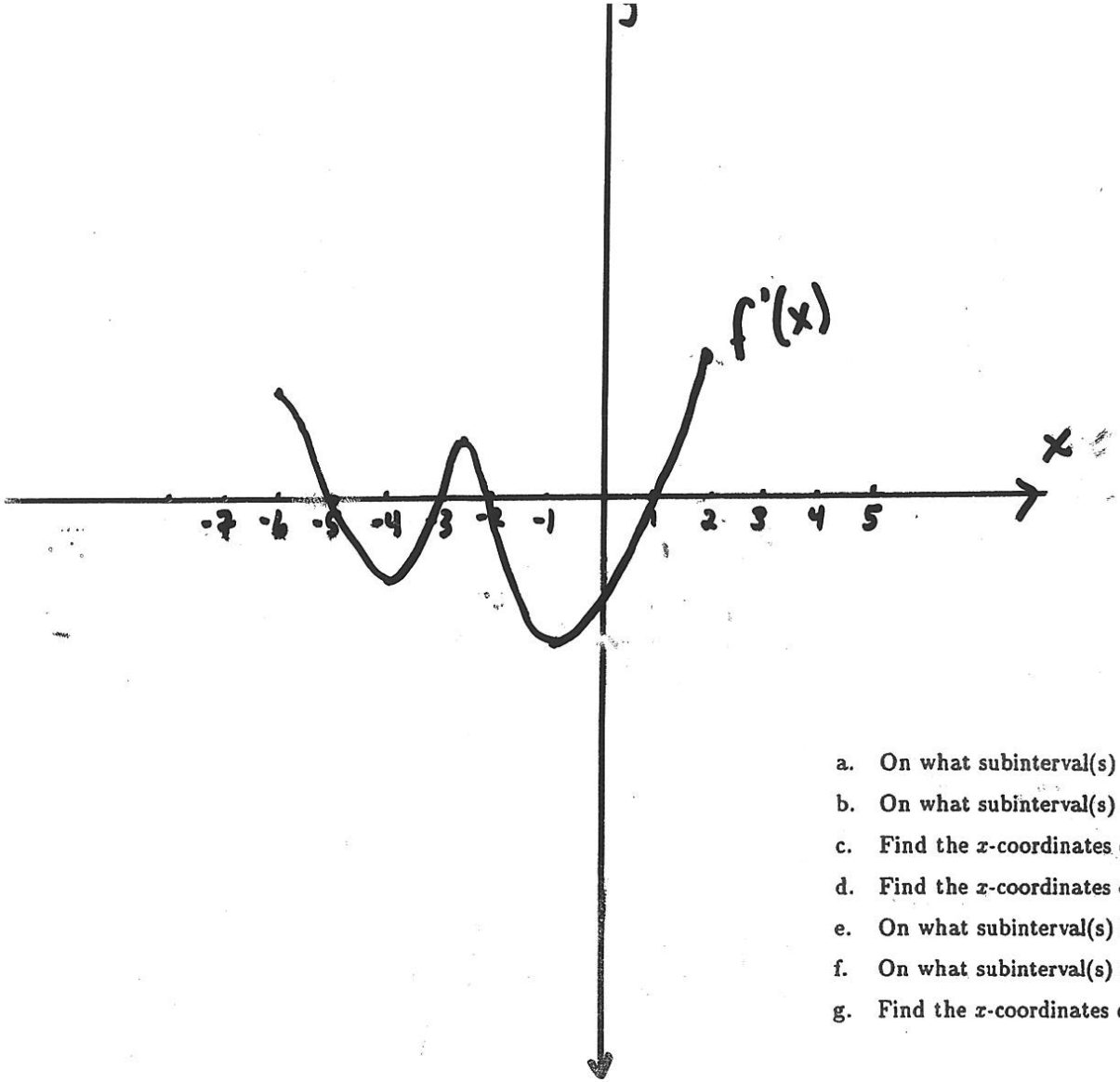
The figure above shows the graph of the derivative of a continuous function f for $0 \leq x \leq 4$.

(a) For what values of x is f increasing? Justify your answer.

(b) For what values of x does f have its relative minimum value? Justify your answer.

(c) For what values of x does f have its relative maximum value? Justify your answer.

(d) If $f(1) = 1$, use your answers to (a), (b), and (c) to sketch the graph of f for $1 \leq x \leq 4$.



a. On what subinterval(s) is f increasing?

b. On what subinterval(s) is f decreasing?

c. Find the x-coordinates of all relative minima of f.

d. Find the x-coordinates of all relative maxima of f

e. On what subinterval(s) is f concave up?

f. On what subinterval(s) is f concave down?

g. Find the x-coordinates of all points of inflection of f.