9. [14 points]

    a. [8 points] Consider functions f satisfying <u>all</u> of the following conditions:

- $f(x)$ is differentiable on the interval $0 < x < 8$.
- The critical points of $f(x)$ in the interval $0 < x < 8$ are $x = 2, 4$, and 6. ($f(x)$ has no other critical points in this interval.)
- The table below shows some values of $f(x)$ and of its derivative $f'(x)$.

x	1	3	5	7
$f(x)$	3	6	11	0
$f'(x)$	-1	?	?	-1

For each of the statements below, decide whether the statement is true for ALL functions f satisfying all of the conditions described above, for SOME of these functions f, or for NONE of these functions f. Circle the <u>one</u> correct choice for each statement.

(i) $f(x)$ has a local minimum at $x = 2$.

            &boxed;ALL   SOME   NONE

ALL

(ii) $f'(3) > 0$.

ALL   SOME   NONE

(iii) $f(x)$ has a local maximum at $x = 4$.

ALL   **SOME**   NONE

(iv) There is exactly one value of a with $3 < a < 7$ such that $f(x)$ has a local maximum at $x = a$.

ALL   SOME   NONE

    b. [6 points] Consider functions g satisfying <u>all</u> of the following conditions:

- $g(z)$ and $g'(z)$ are differentiable on the interval $12 < z < 18$.
- The critical points of $g(z)$ in the interval $12 < z < 18$ are $z = 14$ and $z = 16$. ($g(z)$ has no other critical points in this interval.)
- The table below shows some values of $g(z)$ and of its <u>second derivative</u> $g''(z)$.

z	13	14	15	16	17
$g(z)$	8	?	6	?	2
$g''(z)$	?	-1	?	0	?

For each of the statements below, decide whether the statement is true for ALL functions g satisfying all of the conditions described above, for SOME of these functions g, or for NONE of these functions g. Circle the <u>one</u> correct choice for each statement.

(i) $g(z)$ has a local extremum at $z = 14$.

ALL   SOME   NONE

(ii) $g'(15) > 0$.

ALL   SOME   **NONE**

(iii) $g(z)$ has an inflection point at $z = 16$.

ALL   **SOME**   NONE