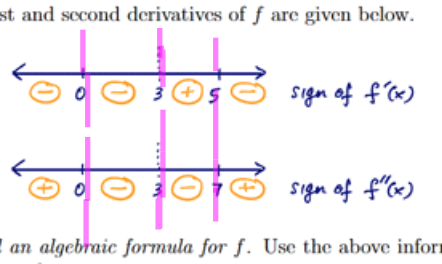
Suppose $f$ satisfies the following properties.

- $f$ is continuous and differentiable on $(-\infty, 3) \cup (3, \infty)$
- $x = 3$ is a vertical asymptote of $f$
- $\lim_{x \to \infty} f(x) = 1$
- the only $x$-values for which $f'(x) = 0$ are $x = 0$ and $x = 5$
- the only $x$-values for which $f''(x) = 0$ are $x = 0$ and $x = 7$

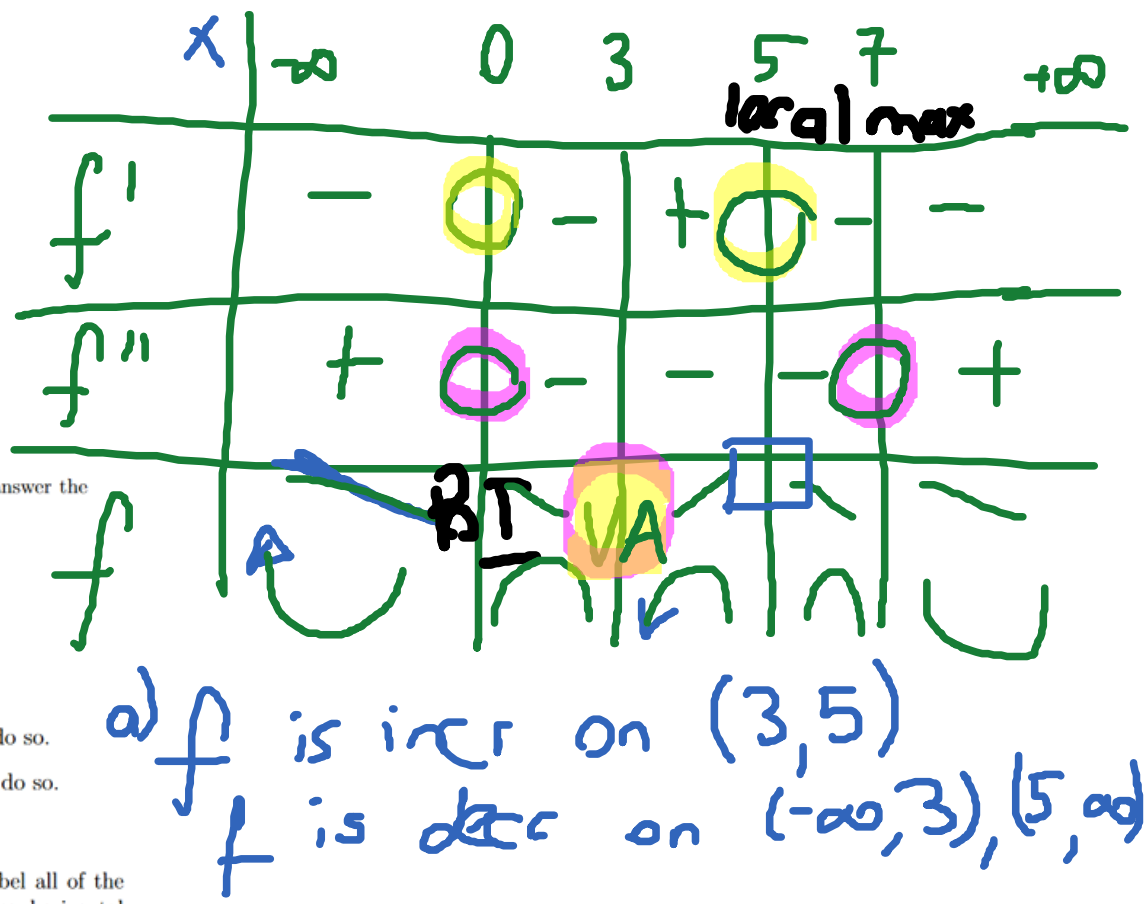
A sign chart for the first and second derivatives of $f$ are given below.




*Do not attempt to find an algebraic formula for $f$.* Use the above information to answer the following questions about $f$.

(a) Where is $f$ increasing?
(b) Where is $f$ concave down?
(c) At which $x$-value(s) does $f$ have a local minimum?
(d) At which $x$-value(s) does $f$ have a local maximum?
(e) Calculate $\lim_{x \to 3^+} f(x)$ or determine there is not enough information to do so.
(f) Calculate $\lim_{x \to -\infty} f(x)$ or determine there is not enough information to do so.

(g) Sketch a possible graph of $y = f(x)$. Make sure to clearly mark and label all of the following: local minima, local maxima, inflection points, vertical asymptotes, horizontal asymptotes. *Your graph does not have to be to scale, but the shape must be correct.*




a) f is incr on (3,5)
f is decr on (-∞,3), (5,∞)

b) f is concave down on (0,3), (3,7)

c) local max at x=5
local min - NONE

e) $\lim_{x \to 3^+} f(x) = -\infty$

f) $\lim_{x \to -\infty} f(x) = \infty$

POI at x=0, 7