

8. (20 points) For each of the following, circle *all* correct answers. In each case, there may be more than one item which is correct.

(a) The function f' is continuous everywhere and changes from negative to positive at $x = a$. Which of the following *must* be true?

- a is a critical point of f .
- $f(a)$ is a local maximum of f .
- $f(a)$ is a local minimum of f .
- $f'(a)$ is a local maximum.
- $f'(a)$ is a local minimum.

(b) A function g is defined on all points of a closed interval. Which of the following *must* be true?

- g must have both a global maximum *and* a global minimum.
- g is differentiable on the interval.
- g has no critical points.
- g is continuous on the interval.
- None of the above statements *must* be true.

(c) For the graph of a cubic polynomial $ax^3 + bx^2 + cx + d$, ($a > 0$), the signs of $f'(0)$, $f''(0)$ and $f'''(0)$ (respectively) could be which of the following? (Circle all that are possible.)

- $-, 0, +$
- $-, 0, -$
- $+, +, +$
- $-, +, -$
- $+, -, +$

(d) The graph of $y = h(x)$ has a local max at $x = 3$ on the closed interval $[0,5]$. Which of the following *must* be true?

- $h'(3)$ is equal to zero or $h(3)$ is an end point.
- h has a critical point at $x = 3$.
- $h''(3)$ is positive.
- $h''(3)$ is negative.
- None of the statements *must* be true.

(e) Which of the following *cannot* be computed using L'Hopital's rule?

- $\lim_{x \rightarrow 0}(\sin x/x)$
- $\lim_{x \rightarrow 0}(\cos x/x)$
- $\lim_{x \rightarrow 0}(x/\sin x)$
- $\lim_{x \rightarrow \infty}(x/e^x)$
- $\lim_{x \rightarrow \infty}(\sin x/x)$