

Math Medic AP Calculus Ultimate Justifications Guide

To justify that...	State/show that...
f is continuous at $x = a$	$\lim_{x \rightarrow a^-} f(x) = \lim_{x \rightarrow a^+} f(x) = L$ $\lim_{x \rightarrow a} f(x) = f(a) = L$
f is differentiable at $x = a$	f is continuous at $x = a$ AND $\lim_{x \rightarrow a^-} f'(x) = \lim_{x \rightarrow a^+} f'(x)$
f is increasing on the interval (a, b)	$f' > 0$ on the interval (a, b)
f is decreasing on the interval (a, b)	$f' < 0$ on the interval (a, b)
f has a critical point at $x = a$	$f'(a) = 0$ or undefined
f has a relative minimum at $x = a$	f' changes from negative to positive at $x = a$
f has a relative maximum at $x = a$	f' changes from positive to negative at $x = a$
f is concave up on the interval (a, b)	$f'' > 0$ on the interval (a, b)
f is concave down on the interval (a, b)	$f'' < 0$ on the interval (a, b)
f has an inflection point at $x = a$	$f''(a) = 0$ or undefined AND f'' changes signs
f has an absolute minimum at $x = a$	f has a critical point at $x = a$ and $f(a)$ has the lowest value of all critical points and endpoints
f has an absolute maximum at $x = a$	f has a critical point at $x = a$ and $f(a)$ has the highest value of all critical points and endpoints

