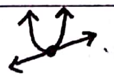
Justifying with Function Behavior

When I am asked to find/do this… (question being asked)	I will think this/justify with this reason… (precise & concise)
Given f(x), find the relative maximum	$f'(x) = 0$ or undefined $f'(x)$ sign chart $f'(x)$ goes from positive to negative
Given f(x), find the relative minimum	$f'(x) = 0$ or undefined $f'(x)$ sign chart $f'(x)$ goes from negative to positive
Given f(x), find the absolute extrema x | y	$f'(x) = 0$ or undefined (sign chart $f'(x)$) TABLE → critical points, endpoints Abs MAX → greatest y-value Abs MIN → least y-value
Given f(x), find where the function is increasing/decreasing	$f'(x) = 0$ or undefined $f'(x)$ sign chart Inc → $f'(x)$ is positive Dec → $f'(x)$ is negative
Given f(x), find where the function has a point of inflection	$f''(x) = 0$ or undefined $f''(x)$ sign chart POI → $f''(x)$ changes signs
Given f(x), determine intervals of concave up/concave down	$f''(x) = 0$ or undefined $f''(x)$ sign chart cc up → $f''(x)$ positive cc down → $f''(x)$ negative
Given f(x), write an equation of the tangent line at x = c (a linear approximation for f(x) at x = c)	$f'(x)$ * $f'(c)$ = slope * $f(c)$ $y - f(c) = f'(c)(x - c)$ $y - y_1 = m(x - x_1)$
Determine if a linear approximation is an overestimate or underestimate	cc up $f''(x)$ positive  underestimate

cc down
$f''(x)$ negative  overestimate

Find a horizontal/vertical tangent line of f(x)	H: $f'(x) = 0$ $y = \#$ V: $f'(x)$ is undefined $x = \#$
Given f(x), show that there exists a c in the interval (a, b) such that f(a) < f(c) < f(b) IVT	*f is continuous on [a,b] K=f(c) is between f(a) and f(b), then Intermediate Value Theorem guarantees a value, c in (a,b) such that f(c)=K.
Given f(x), show that there exists a c in the interval (a, b) such that $f'(c) = \frac{f(b)-f(a)}{b-a}$ MVT	*f is continuous on [a,b] *f is differentiable on (a,b) $\frac{f(b)-f(a)}{b-a} = \square$ By Mean Value Theorem, there exists a value, c, in (a,b) such that $\frac{f(b)-f(a)}{b-a} = f'(c)$
Given f '(c) = 0 and f ''(x), determine if (c, f(c)) is a relative extrema 2nd Der Test	$f''(c)$ negative $\frown$ rel max $f''(c)$ positive $\smile$ rel min $f''(c) = 0$ Inconclusive
If f(x) is differentiable, what else do you know about f(x)?	f(x) is continuous
Given f(x), show f(x) is continuous at x = c Def of Cont	1) $\lim_{x \to c^-} f(x) = \lim_{x \to c^+} f(x) = \square$ ∴ $\lim_{x \to c} f(x) = \square$ 2) $f(c) = \square$ 3) $f(c) = \lim_{x \to c} f(x) = \square$
Given f(x), show f(x) is differentiable at x = c	1) $\lim_{x \to c^-} f'(x) = \lim_{x \to c^+} f'(x) = \square$ ∴ $\lim_{x \to c} f'(x) = \square$ 2) $f'(c)$ defined $= \square$ 3) $f'(c) = \lim_{x \to c} f'(x) = \square$
Given $\frac{dx}{dt}$ and $\frac{dy}{dt}$, find $\frac{dy}{dx}$	$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$ $\frac{dy}{dx} = \frac{dy}{\cancel{dt}} \cdot \frac{\cancel{dt}}{dx}$