Classifying Critical Points

True or False? If the statement is false, provide a counterexample. Then rewrite the statement to make it true. Assume each function is defined and continuous for all real numbers, unless otherwise specified.

1. A critical point (or critical number) of a function is the x-coordinate of a relative minimum or maximum value of the function.

2. A continuous function on a closed interval can have only one maximum value.

3. If $f''(x)$ is always positive, then the function f must have a relative minimum value.

4. If a function f has a local minimum value at $x = c$, then $f'(c) = 0$.

5. If $f'(2) = 0$ and $f''(2) < 0$, then $x = 2$ locates a relative maximum value of f.

6. If $f''(c) = 0$, then $x = c$ is a point of inflection for the function f and cannot be the x-coordinate of a maximum or minimum point on the graph of f.

7. If a function is defined on a closed interval and $f'(x) > 0$ for all x in the interval, then the absolute maximum value of the function will occur at the right endpoint of the interval.

8. The absolute minimum value of a continuous function on a closed interval can occur at only one point.

9. If $x = 2$ is the only critical point of a function f and $f''(2) > 0$, then f(2) is the minimum value of the function.

10. To locate the absolute extrema of a continuous function on a closed interval, you need only compare the y-values of all critical points.

11. If $f'(c) = 0$ and $f'(x)$ decreases through $x = c$, then $x = c$ locates a local minimum value for the function.

12. Absolute extrema of a continuous function on a closed interval can occur only at endpoints or critical points.

Classifying Critical Points

True or False? If the statement is false, provide a counterexample. Then rewrite the statement to make it true. Assume each function is defined and continuous for all real numbers, unless otherwise specified.

1. A critical point (or critical number) of a function is a candidate for the x-coordinate of a relative minimum or maximum value of the function.

   F critical points can occur when neither max or min

   ex) $f(x) = x^3$

   $f'(x) = 3x^2$

   c.p. $x = 0$ not max or min of f

2. A continuous function on a closed interval can have only one absolute maximum value.

   F EVT !

3. If $f''(x)$ is always positive, and $f'(c)=0$ on closed interval then the function f must have a relative minimum value.

   F $y = e^x$ $f''(x) > 0 \Rightarrow$ concave up

4. If a differentiable function f has a local minimum value at x = c, then $f'(c) = 0$.

   F $y = |x|$

5. If $f'(2) = 0$ and $f''(2) < 0$, then x = 2 locates a relative maximum value of f.

   T c.p. $x=2$ concave down

6. If $f''(c) = 0$, then x = c is a candidate for a point of inflection for the function f and cannot be the x-coordinate of a maximum or minimum point on the graph of f.

   F $f(x) = x^4$ $f'(x) = 3x^2$ $f''(x) = 6x$ $x = 0$ is a min

7. If a function is defined on a closed interval and $f'(x) > 0$ for all x in the interval, then the absolute maximum value of the function will occur at the right endpoint of the interval.

   T

8. The absolute minimum value of a continuous function on a closed interval can occur at only one point.

   F $y = \sin x$ can occur at more than one point

9. If x = 2 is the only critical point of a function f and $f''(2) > 0$, then f(2) is the minimum value of the function.

   T concave up

10. To locate the absolute extrema of a continuous function on a closed interval, you need only compare the y-values of all critical points. and endpoints

    F

11. If $f'(c) = 0$ and ~~$f'(x)$ decreases through $x = c$,~~ then x = c locates a local or ↓ max minimum value for the function.

    F $f'(x)$ changes sign from neg to pos at $x = c$ or $f'(x)$ increases through $x = c$ * b/c $\Rightarrow f''(x) > 0 \Rightarrow$ concave up

12. Absolute extrema of a continuous function on a closed interval can occur only at endpoints or critical points.

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