

5. Analytical Applications of Differentiation

Starter Quiz · 课前小测

AP Calculus BC

Name: _____ Score: _____

1. The MVT on $[a, b]$ requires **which** hypotheses?

- ☐ f continuous on $[a, b]$
- ☐ f differentiable on (a, b)
- ☐ $f(a) = f(b)$
- ☐ f is a polynomial

Tick every correct option.

2. A critical point is an interior x where...

- ☐ $f(x) = 0$
- ☐ $f'(x) = 0$ or $f'(x)$ does not exist
- ☐ $f(x)$ is largest
- ☐ $f''(x) = 0$ only

3. A function is increasing on an interval exactly when...

- ☐ $f(x) > 0$ there
- ☐ $f'(x) > 0$ there
- ☐ $f(x) < 0$ there
- ☐ $f''(x) > 0$ there

4. If f' changes from positive to negative at c , then f has a...

- ☐ local minimum
- ☐ local maximum
- ☐ inflection point
- ☐ vertical asymptote

5. To find absolute extrema on $[a, b]$, evaluate f at **which** points?

- ☐ all critical points in $[a, b]$
- ☐ the endpoint a
- ☐ the endpoint b
- ☐ every integer in $[a, b]$

Tick every correct option.

6. A graph is concave up exactly where...

- ☐ $f'(x) > 0$
- ☐ $f''(x) > 0$
- ☐ $f(x) > 0$
- ☐ $f''(x) < 0$

7. If $f'(c) = 0$ and $f''(c) > 0$, then c is a...

- ☐ relative maximum
- ☐ relative minimum
- ☐ inflection point
- ☐ endpoint

8. For $A(x) = 40x - 2x^2$, solve $A'(x) = 40 - 4x = 0$ for the critical x .

9. For $f(x) = x^2$ on $[2, 6]$, find the c guaranteed by the MVT.

10. Find **all** critical points of $f(x) = x^3 - 3x$.

- ☐ $x = 1$
- ☐ $x = -1$
- ☐ $x = 0$
- ☐ $x = 3$

Tick every correct option.

AP Calculus BC

1. **f continuous on $[a, b]$; f differentiable on (a, b)**

Continuous on the closed interval and differentiable on the open one. ($f(a) = f(b)$ is the extra Rolle condition.)

2. **$f'(x) = 0$ or $f'(x)$ does not exist**

Critical points: $f' = 0$ or f' undefined.

3. **$f'(x) > 0$ there**

Positive first derivative means increasing.

4. **local maximum**

Up then down = the top of a hill = local max.

5. **all critical points in $[a, b]$; the endpoint a ; the endpoint b**

Critical points plus both endpoints — that is the full candidate list.

6. **$f''(x) > 0$**

Concave up $\Leftrightarrow f'' > 0$ (slope increasing).

7. **relative minimum**

Concave up at a flat spot = minimum.

8. **10**

$40 - 4x = 0 \Rightarrow x = 10$.

9. **4**

Average = $\frac{36-4}{4} = 8$; $2c = 8 \Rightarrow c = 4 \in (2, 6)$.

10. **$x = 1$; $x = -1$**

$f'(x) = 3(x-1)(x+1) = 0$ at $x = \pm 1$.