

AP Calculus BC

Name: _____ Score: _____

1. The slope of a **secant line** between two points on a curve gives the...
 - ☐ instantaneous rate of change
 - ☐ average rate of change over that interval
 - ☐ exact value of the function
 - ☐ area under the curve
2. The notation $\lim_{x \rightarrow c} f(x) = L$ means that as $x \dots$
 - ☐ equals c , the output is exactly L
 - ☐ gets close to c (without equalling it), the output heads toward L
 - ☐ grows without bound, $f(x)$ reaches L
 - ☐ is greater than c , $f(x)$ equals L
3. To read $\lim_{x \rightarrow c} f(x)$ from a graph, you should look at...
 - ☐ the plotted dot exactly at $x = c$
 - ☐ the height the curve heads toward from both sides of c
 - ☐ the y -intercept of the graph
 - ☐ the highest point on the whole graph
4. A table gives $f(2.9) = 6.9$, $f(2.99) = 6.99$, $f(3.01) = 7.01$, $f(3.1) = 7.1$. Estimate $\lim_{x \rightarrow 3} f(x)$.

5. Evaluate $\lim_{x \rightarrow 2} (3x^2 - x + 4)$.

6. Evaluate $\lim_{x \rightarrow 4} \frac{x^2 - 16}{x - 4}$.

7. Direct substitution into $\lim_{x \rightarrow 4} \frac{x - 4}{x^2 - 16}$ gives $\frac{0}{0}$. What next?
 - ☐ report the limit as 0
 - ☐ factor and cancel the common $(x - 4)$
 - ☐ declare it does not exist
 - ☐ multiply by a conjugate

8. To apply the Squeeze Theorem to f near c , you need **all** of...

- ☐ bounds $g \leq f \leq h$ holding near c
- ☐ the two bounds to have equal limits at c
- ☐ f to be a polynomial
- ☐ the inequality to hold on an interval around c

Tick every correct option.

9. A graph shows the curve heading to height 3 from both sides of $x = 2$, with a filled dot at $(2, 7)$. Which statement matches?

- ☐ $\lim_{x \rightarrow 2} f(x) = 7$
- ☐ $\lim_{x \rightarrow 2} f(x) = 3$ and $f(2) = 7$
- ☐ the limit does not exist
- ☐ $f(2) = 3$

10. Select **all** conditions required for f to be continuous at c .

- ☐ $f(c)$ is defined
- ☐ $\lim_{x \rightarrow c} f(x)$ exists
- ☐ $\lim_{x \rightarrow c} f(x) = f(c)$
- ☐ f is a polynomial

Tick every correct option.

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1. **average rate of change over that interval**

A secant joins two points, so its slope is the **average rate of change** over that interval.

2. **gets close to c (without equalling it), the output heads toward L**

$x \rightarrow c$ means x **approaches** c without touching it, and $f(x)$ heads toward L .

3. **the height the curve heads toward from both sides of c**

A limit is the shared height approached from both sides — the dot at c is irrelevant.

4. **7**

Both sides close in on 7, so the limit is 7.

5. **14**

Direct substitution: $3(4) - 2 + 4 = 14$.

6. **8**

Factor: $\frac{(x-4)(x+4)}{x-4} = x + 4 \rightarrow 8$.

7. **factor and cancel the common $(x - 4)$**

Polynomial over polynomial, both zero at 4 $\rightarrow$ factor: $\frac{x-4}{(x-4)(x+4)} = \frac{1}{x+4} \rightarrow \frac{1}{8}$.

8. **bounds $g \leq f \leq h$ holding near c ; the two bounds to have equal limits at c ; the inequality to hold on an interval around c**

You need two-sided bounds with equal limits, valid near c . f need not be a polynomial — that is the whole point.

9. **$\lim_{x \rightarrow 2} f(x) = 3$ and $f(2) = 7$**

The curve's approach gives the limit 3; the filled dot gives the separate value $f(2) = 7$.

10. **$f(c)$ is defined; $\lim_{x \rightarrow c} f(x)$ exists; $\lim_{x \rightarrow c} f(x) = f(c)$**

The three conditions are defined, limit-exists, and equal. Being a polynomial is not required.