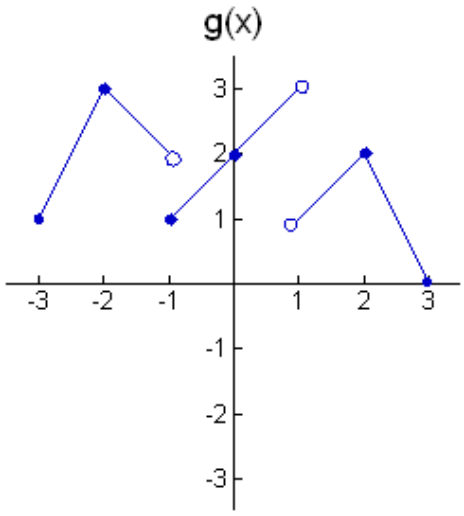
Name_____ Date_____ Exclamation Point_____

AP Calculus Test: 3.1-3.5, No Calculator




**Part I: Multiple Choice**

**Use the graph of the function $g(x)$ shown at right to answer questions 1-3.**

_____ 1. Is $g(x)$ continuous on the interval $(-2.334,-1]$?

(A) Yes (B) No (C) I'm not telling!
(D) Don't pick (D) (E) Who wants to know?

_____ 2. The smallest value of $a \in \mathbb{R}$ such that $g(x)$ is continuous on $[a,3]$ is

(A) 0 (B) 1 (C) 2 (D) 3 (E) No such value exists

_____ 3. Find the number $x=b$ such that $g(x)$ is continuous in $(-1,b)$ but not in $[-1,b]$.

(A) $-1$ (B) 0 (C) $\frac{1}{2}$ (D) 0.999999 (E) 1

_____ 4. A function $f(x)$ is continuous for all *x*. The function satisfies

$$f(1)=10,\ f(2)=3,\ f(3)=-5, \text{ and } f(4)=-18$$

The IVT says that the equation

(A) $f(x)=8.675309$ has a solution for some $x \in (1,2)$.

(B) $f(x)=8.675309$ has a solution for some $x \in (2,3)$.

(C) $f(x)=8.675309$ has a solution for some $x \in (3,4)$.

(D) $f(x)=8.675309$ has a solution for some *x* with $x<-18$.

(E) It cannot be determined from the information whether $f(x)=8.675309$ has a solution.

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_____ 5. $$f(x)=\begin{cases} \dfrac{x^2+1}{x-1}, & x<0 \\ 2x-1, & 0 \le x \le 3 \\ \sqrt{x+1}, & x>3 \end{cases}$$

Let $f(x)$ be defined by the piecewise equation above, then $f(x)$ is continuous

(A) for all real numbers (B) for all $x \neq 0$ (C) for all $x \neq 3$ (D) for all $x \neq 0,\ 3$ (E) for all $x \neq 0,1,$ or 3

_____ 6. If $g(x)=\cos x$, then on the interval $\left[\pi, \frac{4\pi}{3}\right]$, by the IVT, $g(x)$ MUST equal what value for some $x \in \left(\pi, \frac{4\pi}{3}\right)$? (A) 1 (B) -1.5 (C) $\frac{7\pi}{6}$ (D) $-0.6541$ (E) IVT does not apply

**Part II: Free Response**: Answer all questions below the given line. **Show all steps, label parts, and write legibly.**

1. Let $f(x)=\begin{cases}\frac{1}{x}, & x<1\\ ax-b, & 1\le x<2\\ 4, & x=2\\ bx^2+a, & x>2\end{cases}$

   (a) Find $f(2)$

   (b) Find $\lim_{x\to 2^-} f(x)$ as a function of *a* and *b*.

   (c) Find $\lim_{x\to 2^+} f(x)$ as a function of *a* and *b*.

   (d) Find all SIMPLIFIED values of *a* and *b* that make *f* continuous at $x=2$. Show the work that leads to your answer.

   (e) Does the Intermediate Value Theorem apply to $f(x)$ on the interval $\left[-1,\frac{1}{2}\right]$? Specifically explain why or why not.

   (f) Find $\lim_{x\to -\infty} f(x)$

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