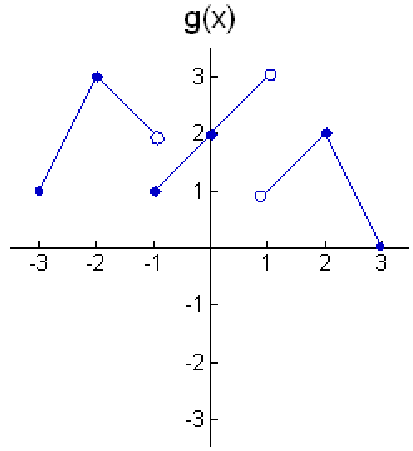
Name______________________________________ Date________________________ Period___________

AP Calculus TEST: 3.1-3.5 No Calculator

Part I: Multiple Choice—write the CAPITAL LETTER in the blank to the left of the problem number.

Use the graph of the function $g(x)$ shown at right to answer questions 1-2.



_____ 1. 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

_____ 2. 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

_____ 3. If $g(x) = \cos x$, then on the interval $\left[\frac{7\pi}{6}, \frac{7\pi}{4}\right]$, by the IVT, $g(x)$ MUST equal what value for some $x \in \left(\frac{7\pi}{6}, \frac{7\pi}{4}\right)$?

(A) -1 (B) 1 (C) $\frac{4\pi}{3}$ (D) 0 (E) $\frac{\sqrt{3}}{2}$

_____ 4. $\lim\limits_{x \to 0} \frac{5x^4 + 8x^2}{3x^4 - 16x^2} =$ (A) $-\frac{1}{2}$ (B) 0 (C) 1 (D) $\frac{5}{3}+1$ (E) nonexistent

_____ 5. $\lim\limits_{x \to 8} \frac{\frac{4}{x} - \frac{1}{2}}{x - 8} =$ (A) DNE (B) -16 (C) 16 (D) $\frac{1}{16}$ (E) $-\frac{1}{16}$

_____ 6. Evaluate $\lim\limits_{x \to 0} \left(\frac{3\sin 3x}{2\sin 9x} + \frac{x}{x} - \frac{\tan x}{\cos x + 1} \right) =$ (A) DNE (B) 0 (C) $\frac{11}{2}$ (D) $\frac{3}{2}$ (E) 3

_____ 7. If $f(x) = \begin{cases} \frac{\sqrt{2x+5} - \sqrt{x+7}}{x-2}, & x \neq 2 \\ k, & x = 2 \end{cases}$, find the value of *k* that makes $f(x)$ continuous at $x = 2$.

(A) 0 (B) $\frac{1}{6}$ (C) $\frac{1}{3}$ (D) 1 (E) $\frac{7}{5}$

_____ 8. The function *f* is continuous on $[-3,2]$ and has values given in the table below. If the equation $f(x) = 2$ has at least 2 solutions in the interval $(-3,2)$ if $k =$

x	-3	0	2
$f(x)$	5	k	3.2

(A) 5 (B) 3.2 (C) 2 (D) 10 (E) -3

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

9. Let $f(x)=\begin{cases} \dfrac{(1+x)^2+2(1+x)-3}{x+4}, & x\le -3 \\ 2x-a, & -3<x<1 \\ 3, & x=1 \\ bx^2+a, & 1<x<555 \\ \dfrac{-4x^3+2x^2+7x+14}{\sqrt{16x^6+4x^4+13x^2+11}}, & x\ge 555 \end{cases}$

(a) Find $\lim\limits_{x\to -4} f(x)$

(b) Find $\lim\limits_{x\to\infty} f(x)$

(c) Find all values of a and b that make f continuous at $x=1$. Show all steps, and use correct notation, notation, notation.

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2. Evaluate the following. For each, show all steps and work. Careful rewriting the "lim" each time!!! Part e) doesn't require any work.

a) $\lim_{x \to 0} \dfrac{\tan 2x + x}{5x} =$

b) $\lim_{x \to 0} \dfrac{4x \sin x}{1 - \cos x} =$

c) $\lim_{x \to -2} \dfrac{x^2 - 4}{\sqrt{6 + x} - 2} =$

d) $\lim_{x \to 3} \dfrac{\frac{2}{x+2} - \frac{2}{5}}{x - 3} =$

e) $\lim_{x \to -\infty} \dfrac{4x^5 + 2x^2 - 3x + 1}{\sqrt{9x^{10} + 11x^9 + 12x^2 + 13x + 14}} =$

f) $\lim_{x \to 5^+} \dfrac{x^2 |10 - 2x|}{\sin\left(\frac{x\pi}{6}\right)\left(3x^2 - 18x + 15\right)} =$