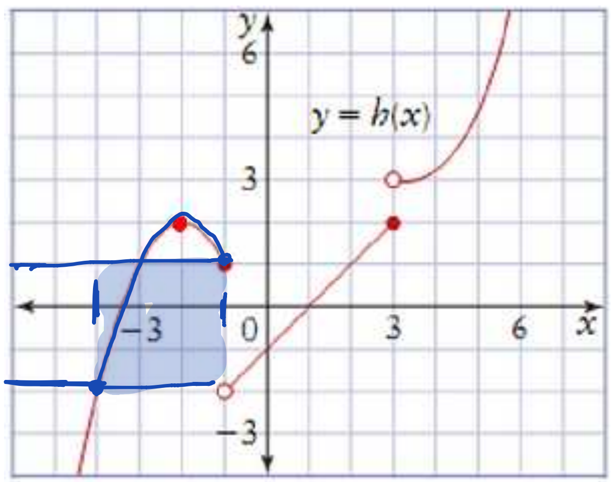
Name KEY ______________________ Date ______________________ Period ___________

AP Calculus TEST: 1.1-1.5 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 $h(x)$, shown below right, to answer questions 1-3.



__D__ **1**. The smallest value of $a \in \mathbb{R}$ such that $h(x)$ is continuous on $[a,3]$ is No 1st real number to right of $x=-1$

(A) 0 (B) -1 (C) -0.9 (D) No such value exists

__D__ **2**. On the interval $-4 \le x \le -1$, the IVT guarantees a value $-4 < k < -1$ such that $h(k) = P$. According to the IVT, which of the following of P is NOT guaranteed?

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

__A__ **3**. $\lim\limits_{x \to -1^-} h(h(x)) = h\left(\lim\limits_{x \to -1^-} h(x)\right) = \lim\limits_{x \to 1^-} h(x) = 0$

(A) 0 (B) 1 (C) 2 (D) -2

__B__ 4. The line $y = -5$ is a horizontal asymptote to the graph of which of the following functions?

(A) $y = e^{-x} + 5$ (B) $y = \dfrac{25x^3 + 2x - 1}{\sqrt{25x^6 + 50}}$ (C) $y = \dfrac{50x^3 - 2x^2 - 7}{7 + 9x + 10x^3}$ (D) $y = -\dfrac{\sin(10x)}{5x}$

$y \approx \dfrac{25x^3}{5x^3} \to$ HA @ $y \pm 5$

__A__ 5. $\lim\limits_{x \to -1} \dfrac{2 - \sqrt{x+5}}{(x-1)(x+1)} \cdot \dfrac{2 + \sqrt{x+5}}{2 + \sqrt{x+5}}$ $\frac{0}{0}$

(A) $\frac{1}{8}$ (B) $-\frac{1}{8}$ (C) $\frac{1}{2}$ (D) $\frac{1}{2}$

$\lim\limits_{x \to -1} \dfrac{(4 - (x+5))}{(x-1)(x+1)(2+\sqrt{x+5})}$

$\lim\limits_{x \to -1} \dfrac{-x-1}{(x-1)(x+1)(2+\sqrt{x+5})}$

$\lim\limits_{x \to -1} \dfrac{(-1)\cancel{(x+1)}}{(x-1)\cancel{(x+1)}(2+\sqrt{x+5})}$

$\dfrac{-1}{(-2)(2+2)}$

$\dfrac{-1}{-8}$

$\dfrac{1}{8}$

C 6. $\lim_{x\to 5} \dfrac{\frac{1}{x+2}-\frac{1}{7}}{x-5}$ % $\cdot \dfrac{(7(x+2))}{(7(x+2))}$ (A) -1 (B) $\dfrac{1}{49}$ (C) $-\dfrac{1}{49}$ (D) $\dfrac{1}{7}$

$\lim_{x\to 5} \dfrac{7-(x+2)}{(x-5)(7)(x+2)}$

$\lim_{x\to 5} \dfrac{-x+5}{(x-5)(7)(x+2)}$

$\lim_{x\to 5} \dfrac{(-1)\cancel{(x-5)}}{\cancel{(x-5)}(7)(x+2)}$

$\dfrac{-1}{7(7)}$

$\dfrac{-1}{49}$

A 7. Evaluate $\lim_{x\to 0^+}\left(\dfrac{(x-1)^3}{x^3-1}+\dfrac{4\tan 3x}{3\tan 4x}-\dfrac{x}{|x|}\right)=$ (A) 1 (B) 3 (C) 8 (D) $\dfrac{16}{9}$

$\dfrac{(-1)^3}{-1}+\dfrac{4}{3}\left(\dfrac{3}{4}\right)-\dfrac{2}{|2|}$

$\dfrac{-1}{-1}+1-1$

$1+1-1$

1

$$f(x)=\begin{cases}\dfrac{x^2+\sin^2 2x}{x^2}, & x\neq 0\\ b, & x=0\end{cases}$$

C 8. Let f be the function defined above. For what value of b is f continuous at $x=0$?

(A) 2 (B) 3 (C) 5 (D) no such value exists

$\lim_{x\to 0} \dfrac{x^2+\sin^2 2x}{x^2}$

$\lim_{x\to 0}\left[\dfrac{x^2}{x^2}+\dfrac{(\sin 2x)^2}{x^2}\right]$

$\lim_{x\to 0}\left[1+\dfrac{\sin 2x}{2x}\cdot\dfrac{\sin 2x}{2x}\left(\dfrac{2\cdot 2}{1}\right)\right]$

$1+1\cdot 1\cdot 4$

5

B 9. The function f is continuous on $[-4,5]$ and has values given in the table below. The equation $f(x)=6$ at least two solutions in the interval $(-4,5)$ if $p=$

x	-4	0	5
$f(x)$	1	p	4

(A) 6 (B) 6.1 (C) 5.9 (D) 5

$p>6$

Part II: Free Response: Answer all questions in the space provided.. **Show all steps on part (e), and all parts, use proper notation, notation, notation. No Notation, No-No point!!**

10. Let $f(x)$ be the totally awesome piece wise function given below.

$$f(x)=\begin{cases} \dfrac{2x^5+7x^3-2x+1}{\sqrt{9x^{12}+2x^4+11}}, & x\le -3 \\ ax^2-b, & -3<x<-1 \\ 10, & x=-1 \\ 2ax-3b, & -1<x<-\dfrac{1}{2} \\ \dfrac{x^2-4x+3}{x^2\left|2x-2\right|}, & -\dfrac{1}{2}\le x<3 \\ \dfrac{(x-3)^2}{4-x}, & x\ge 3 \end{cases}$$

(a) Find $\lim\limits_{x\to -\infty} f(x) = 0$ √1 $\approx \lim\limits_{x\to-\infty} \dfrac{2x^5}{3x^6} = 0$	
(b) Find $\lim\limits_{x\to 1^-} f(x) = 1$ √2 $\lim\limits_{x\to 1^-} \left[\dfrac{(x-3)}{x^2}\right]\left[\dfrac{(x-1)}{\lvert 2x-2\rvert}\right]$ $\left[\dfrac{-2}{1}\right]\left[\dfrac{-1}{\lvert -2\rvert}\right]$ $-2\left(-\frac{1}{2}\right)=1$	
(c) Find $\lim\limits_{x\to 4^+} f(x) = $ DNE or $-\infty$ √3	

(d) Is $f(x)$ continuous at $x = 3$? Justify using the 3-step definition of continuity at a point.

$\lim\limits_{x\to 3^-} f(x) = \frac{9-12+3}{9+9} = \frac{0}{18} = 0$

$f(3) = \frac{0}{1} = 0$ √4

$\lim\limits_{x\to 3^+} f(x) = 0$

f(x) is continuous at $x=3$ √5

Since $0=0=0$. √6

(e) If a and b are constants that make $f(x)$ continuous at $x = -1$, **what is the value of** a?

$\lim\limits_{x\to -1^-} f(x) = a-b$ √7

$f(-1) = 10$

$\lim\limits_{x\to -1^+} f(x) = -2a-3b$ √8

So $a-b=10 \rightarrow a = 10+b$

$-2a-3b=10$

sub

$-2(10+b)-3b=10$

$-20-2b-3b=10$

$-5b=30$

$b=-6$

So, $a = 10-6$

$a=4$ √9