AP Calculus AB Chapter 1 Limits Review Name:______________________________

1. $g(x) = \begin{cases} x+5, x<2 \\ 11, x=2 \\ 2x-1,\ 2<x<5 \\ 20, x=5 \\ x+4, x>5 \end{cases}$ Find the following :

a) $\lim_{x\to-\infty} g(x) =$	b) $\lim_{x\to2^-} g(x) =$	c) $\lim_{x\to2^+} g(x) =$
d) $\lim_{x\to2} g(x) =$	e) $\lim_{x\to5^-} g(x) =$	f) $\lim_{x\to5^+} g(x) =$
g) $\lim_{x\to5} g(x) =$	h) $\lim_{x\to6^+} g(x) =$	i) $\lim_{x\to\infty} g(x) =$

Use Continuity conditions to justify whether f(x) is continuous or discontinuous . If discontinuous, identify type of discontinuity

2) $f(x) = \begin{cases} x^2+5, x\geq 3 \\ x^2-2, x<3 \end{cases}$

3) Find the k value that will make the function f(x) continuous.

b) $f(x) = \begin{cases} \frac{x^2+x-6}{x+3}, & x\neq -3 \\ k, & x = -3 \end{cases}$

PAST AP FREE-RESPONSE PROBLEMS COVERED BY THIS CHAPTER

Note: These and other questions can be found at apcentral.com.
2003 AB 6a
2006 BC 3c
2008 AB 6d

MULTIPLE-CHOICE QUESTIONS

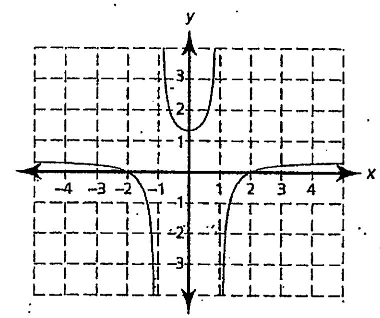
A calculator may not be used on the following questions.

1. Evaluate the limit, if it exists: $\lim_{x\to 2}\frac{x^2+x-6}{2-x}$.
   (A) 5
   (B) 3
   (C) −3
   (D) −5
   (E) The limit does not exist.

2. Evaluate the limit, if it exists: $\lim_{x\to 9}\frac{\sqrt{x-5}-2}{x-9}$.
   (A) $\frac{1}{4}$
   (B) $-\frac{1}{4}$
   (C) 1
   (D) 0
   (E) The limit does not exist.

3. Evaluate the limit, if it exists: $\lim_{x\to 2}\frac{\frac{1}{x}-\frac{1}{2}}{x-2}$.
   (A) $\frac{1}{4}$
   (B) $-\frac{1}{4}$
   (C) 1
   (D) −1
   (E) The limit does not exist.

4) For what value of k is the function $f(x)=\begin{cases}\frac{2x^2+5x-3}{x^2-9}, & x\neq -3\\ k, & x=-3\end{cases}$ continuous at $x=-3$?
(A) $-\frac{7}{6}$
(B) $-\frac{5}{6}$
(C) 0
(D) $\frac{5}{6}$
(E) $\frac{7}{6}$



5) The function $g(x)$ is shown in the graph above and is of the form $g(x)=\frac{x^2+a}{bx^2-3}$. Which of the following could be the values of the constants a and b?
(A) $a=-2,\ b=-1$
(B) $a=-2,\ b=-3$
(C) $a=-4,\ b=3$
(D) $a=-4,\ b=-3$
(E) $a=4,\ b=3$

6) Identify the vertical asymptotes for $f(x)=\frac{x^2+3x-4}{x^2+x-2}$.
(A) $x=-2, x=1$
(B) $x=-2$
(C) $x=1$
(D) $y=-2, y=1$
(E) $y=-2$

AP Calculus AB Chapter 1 Limits Review Name: KEY

1. $g(x) = \begin{cases} x+5, x<2 \\ 11, x=2 \\ 2x-1, \ 2<x<5 \\ 20, x=5 \\ x+4, x>5 \end{cases}$ Find the following :

a) $\lim_{x\to-\infty} g(x) =$ $\lim_{x\to-\infty} \frac{x+5}{1} = \boxed{-\infty}$	b) $\lim_{x\to2^-} g(x) =$ $\lim_{x\to2^-} x+5 = \boxed{7}$	c) $\lim_{x\to2^+} g(x) =$ $\lim_{x\to2^+} 2x-1 = \boxed{3}$
d) $\lim_{x\to2} g(x) =$ $\lim_{x\to2^-} g(x) \neq \lim_{x\to2^+} g(x)$ $\boxed{DNE}$	e) $\lim_{x\to5^-} g(x) =$ $\lim_{x\to5^-} 2x-1 = \boxed{9}$	f) $\lim_{x\to5^+} g(x) =$ $\lim_{x\to5^+} x+4 = \boxed{9}$
g) $\lim_{x\to5} g(x) =$ $\boxed{9}$	h) $\lim_{x\to6^+} g(x) =$ $\lim_{x\to6^+} x+4 = \boxed{10}$	i) $\lim_{x\to\infty} g(x) =$ $\lim_{x\to\infty} \frac{x+4}{1} = \boxed{+\infty}$

Use Continuity conditions to justify whether f(x) is continuous or discontinuous . If discontinuous, identify type of discontinuity

2) $f(x) = \begin{cases} x^2+5, x \geq 3 \\ x^2-2, x<3 \end{cases}$

i) $f(3) = 3^2+5 = 14$

ii) $\lim_{x\to3^-} x^2-2 = 7$ $\quad \lim_{x\to3^+} x^2+5 = 14$ $\quad$ Since $\lim_{x\to3^-} f(x) \neq \lim_{x\to3^+} f(x)$

$\lim_{x\to3} f(x) = DNE$

Nonremovable discontinuity since limit does not exist at $x=3$

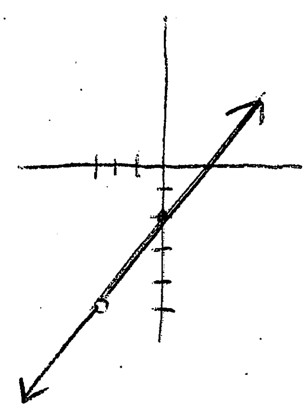
3) Find the k value that will make the function f(x) continuous.

b) $f(x) = \begin{cases} \frac{x^2+x-6}{x+3}, & x \neq -3 \\ k, & x=-3 \end{cases}$

i) $f(-3) = k$

ii) $\lim_{x\to-3} \frac{x^2+x-6}{x+3} = \frac{0}{0}$ $\lim_{x\to-3} \frac{\cancel{(x+3)}(x-2)}{\cancel{(x+3)}} = -5$

iii) $f(-3) = \lim_{x\to-3} f(x)$ $\quad \boxed{k=-5}$



PAST AP FREE-RESPONSE PROBLEMS COVERED BY THIS CHAPTER

Note: These and other questions can be found at apcentral.com.
2003 AB 6a
2006 BC 3c
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MULTIPLE-CHOICE QUESTIONS

A calculator may not be used on the following questions.

1. Evaluate the limit, if it exists: $\lim_{x\to 2}\frac{x^2+x-6}{2-x}$.

$\lim_{x\to 2}\frac{(x+3)(\cancel{x-2})}{-(\cancel{x-2})} = \frac{5}{-1} = \boxed{-5}$

(A) 5
(B) 3
(C) –3
(D) –5
(E) The limit does not exist.

2. Evaluate the limit, if it exists: $\lim_{x\to 9}\frac{\sqrt{x-5}-2}{x-9}$. $\frac{(\sqrt{x-5}+2)}{(\sqrt{x-5}+2)} = \lim_{x\to 9}\frac{x-5-4}{(x-9)(\sqrt{x-5}+2)}$

$= \lim_{x\to 9}\frac{(\cancel{x-9})}{(\cancel{x-9})(\sqrt{x-5}+2)} = \frac{1}{\sqrt{4}+2} = \boxed{\frac{1}{4}}$

(A) $\frac{1}{4}$
(B) $-\frac{1}{4}$
(C) 1
(D) 0
(E) The limit does not exist.

3. Evaluate the limit, if it exists: $\lim_{x\to 2}\frac{\frac{1}{x}-\frac{1}{2}}{x-2}$.

$\frac{\frac{2-x}{2x}\cdot\frac{1}{x-2}}{x-2\cdot\frac{1}{x-2}} = \lim_{x\to 2}\frac{-(\cancel{x-2})}{2x(\cancel{x-2})}$

$= \boxed{\frac{-1}{4}}$

(A) $\frac{1}{4}$
(B) $-\frac{1}{4}$
(C) 1
(D) –1
(E) The limit does not exist.

4) For what value of k is the function $f(x)=\begin{cases}\dfrac{2x^2+5x-3}{x^2-9}, & x\neq -3\\ k, & x=-3\end{cases}$ continuous at $x=-3$?

$i)\ f(-3)=k$

(A) $-\frac{7}{6}$

(B) $-\frac{5}{6}$

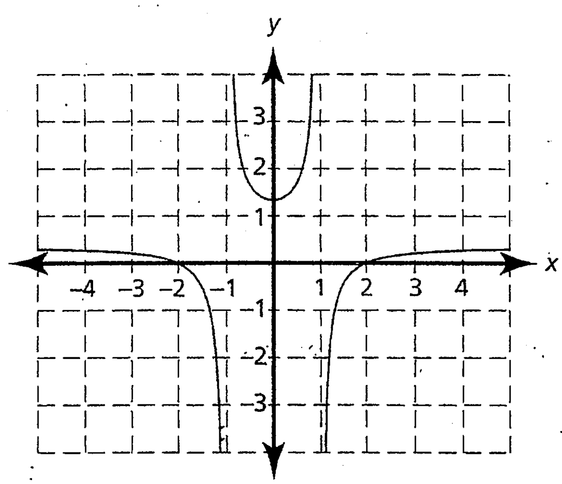
(C) 0

(D) $\frac{5}{6}$

(E) $\frac{7}{6}$

$ii)\ \lim\limits_{x\to -3}\dfrac{(2x-1)\cancel{(x+3)}}{\cancel{(x+3)}(x-3)}=\dfrac{-6-1}{-3-3}=\dfrac{-7}{-6}=\boxed{\dfrac{7}{6}}$

$iii)\ f(-3)=\lim\limits_{x\to -3}f(x),\quad k=7/6$



x-int: $(-2,0)\ (2,0)$

V.A: $x=-1,\ x=1$

$x^2+a=0$ at $x=2$

$2^2+a=0\quad \boxed{a=-4}$

$bx^2-3=0$: at $x=1,\ x=-1$

$b(1)^2-3=0\quad \boxed{b=3}$

5) The function $g(x)$ is shown in the graph above and is of the form $g(x)=\dfrac{x^2+a}{bx^2-3}$. Which of the following could be the values of the constants a and b?

(A) $a=-2,\ b=-1$

~~(B) $a=-2,\ b=-3$~~

(C) $a=-4,\ b=3$

~~(D) $a=-4,\ b=-3$~~

(E) $a=4,\ b=3$

$$\boxed{g(x)=\frac{x^2-4}{3x^2-3}}$$

6) Identify the vertical asymptotes for $f(x)=\dfrac{x^2+3x-4}{x^2+x-2}$.

$\dfrac{\cancel{(x-1)}(x+4)}{\cancel{(x-1)}(x+2)}$

~~(A) $x=-2,\ x=1$~~

(B) $x=-2$

~~(C) $x=1$~~

(D) $y=-2,\ y=1$

(E) $y=-2$

$\boxed{x=-2}$