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

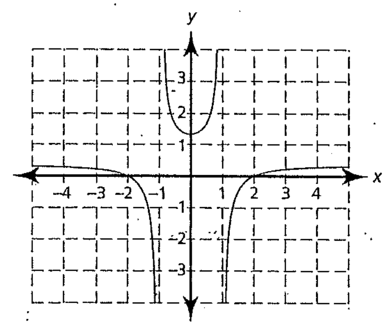
A calculator may not be used on the following questions.

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

2. Evaluate the limit, if it exists: $\lim_{x\to 9}\dfrac{\sqrt{x-5}-2}{x-9}$.
   (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: $\lim_{x\to 2}\dfrac{\frac{1}{x}-\frac{1}{2}}{x-2}$.
   (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 $f(x)=\begin{cases}\dfrac{2x^2+5x-3}{x^2-9}, & x\neq -3\\ k, & x=-3\end{cases}$ 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 $g(x)=\dfrac{x^2+a}{bx^2-3}$. 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) $a=4,\ b=3$

6) Identify the vertical asymptotes for $f(x)=\dfrac{x^2+3x-4}{x^2+x-2}$.
   (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) $\lim\limits_{x\to-\infty} g(x) =$ $\lim\limits_{x\to-\infty} x+5 = \boxed{-\infty}$	b) $\lim\limits_{x\to2^-} g(x) =$ $\lim\limits_{x\to2^-} x+5 = \boxed{7}$	c) $\lim\limits_{x\to2^+} g(x) =$ $\lim\limits_{x\to2^+} 2x-1 = \boxed{3}$
d) $\lim\limits_{x\to2} g(x) =$ $\lim\limits_{x\to2^-} g(x) \neq \lim\limits_{x\to2^+} g(x)$ $\boxed{DNE}$	e) $\lim\limits_{x\to5^-} g(x) =$ $\lim\limits_{x\to5^-} 2x-1 = \boxed{9}$	f) $\lim\limits_{x\to5^+} g(x) =$ $\lim\limits_{x\to5^+} x+4 = \boxed{9}$
g) $\lim\limits_{x\to5} g(x) =$ $\boxed{9}$	h) $\lim\limits_{x\to6^+} g(x) =$ $\lim\limits_{x\to6^+} x+4 = \boxed{10}$	i) $\lim\limits_{x\to\infty} g(x) =$ $\lim\limits_{x\to\infty} x+4 = \boxed{+\infty}$

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

$\lim\limits_{x\to3} f(x) = DNE$

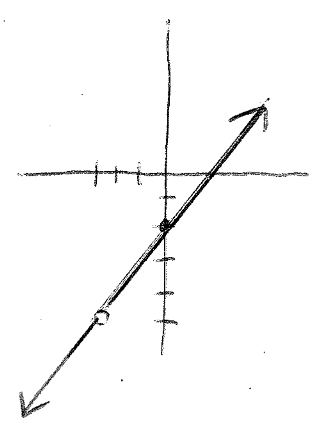
Nonremovable discontinuity since limit does not exist at $x=3$

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

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

$\lim\limits_{x\to-3} \dfrac{x^2+x-6}{x+3} = \lim\limits_{x\to-3} \dfrac{\cancel{(x+3)}(x-2)}{\cancel{(x+3)}} = -5$

$k = -5$



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: $\lim\limits_{x\to 2}\dfrac{x^2+x-6}{2-x}$.

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

(A) 5
(B) 3
(C) –3
$\boxed{\text{(D) –5}}$
(E) The limit does not exist.

2. Evaluate the limit, if it exists: $\lim\limits_{x\to 9}\dfrac{\sqrt{x-5}-2}{x-9}$.

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

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

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

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

$$\frac{\frac{2-x}{2x}\cdot\frac{1}{x-2}}{x-2\cdot\frac{1}{x-2}} = \lim_{x\to 2}\frac{-\cancel{(x-2)}}{2x\cancel{(x-2)}} = \boxed{\frac{-1}{4}}$$

(A) $\dfrac{1}{4}$
$\boxed{\text{(B) } -\frac{1}{4}}$
(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 $x=-3$?

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

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

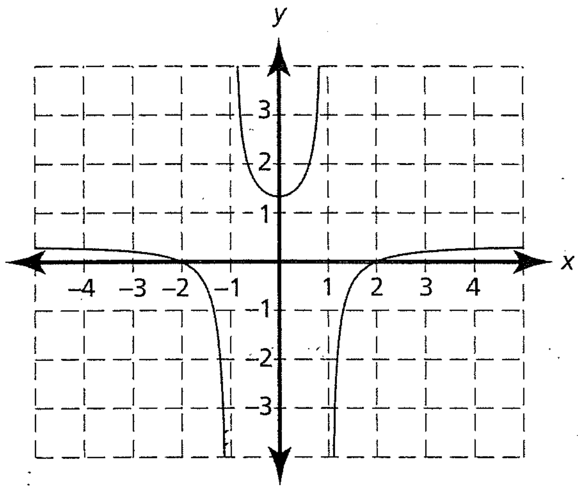
(C) 0

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

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

$$\lim_{x\to -3}\frac{(2x-1)\cancel{(x+3)}}{\cancel{(x+3)}(x-3)}=\frac{-6-1}{-3-3}=\frac{-7}{-6}=\boxed{\frac{7}{6}}$$

$k = 7/6$



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

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

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

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

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

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

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 $f(x)=\dfrac{x^2+3x-4}{x^2+x-2}$.

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

(B) $x=-2$

(C) $x=1$

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

(E) $y=-2$

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

$\boxed{x=-2}$