Name: _____ Date: _____ Row: _____ Period: _____

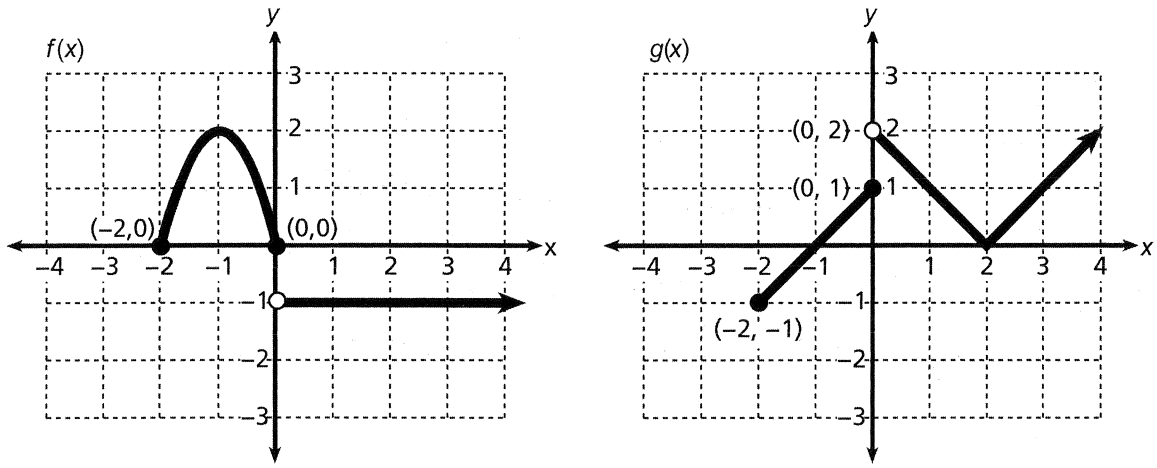
LIMITS AND THEIR PROPERTIES

Work through the FRQ on a separate sheet of paper and show all your work for the MC questions.

FREE-RESPONSE QUESTION

A calculator may not be used for this question.

1. Use the graphs of $f(x)$ and $g(x)$ given below to answer the following questions:



a. Is $f[g(x)]$ continuous at $x = 0$? Explain why or why not.
b. Is $g[f(x)]$ continuous at $x = 0$? Explain why or why not.
c. What is $\lim_{x\to\infty} f[g(x)]$? Explain your reasoning.
d. If $h(x) = \begin{cases} f(x)+g(x), & -2 \le x < 0 \\ k \cdot g(x)f(x), & x \ge 0 \end{cases}$, what is k so that $h(x)$ is continuous at $x = 0$?

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. Evaluate the limit, if it exists: $\lim_{x\to 1}\dfrac{\tan^{-1} x}{\sin^{-1} x+1}$.

(A) 0

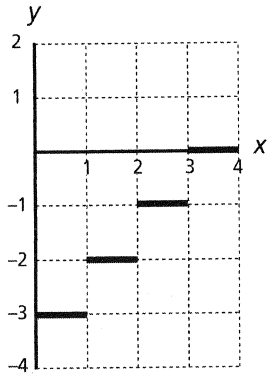
(B) $\frac{1}{4}$

(C) $\frac{1}{2}$

(D) $\frac{\pi}{2}$

(E) $\dfrac{\pi}{2\pi+4}$

5. Estimate the limit, if it exists: $\lim_{x\to 3} f(x)$ where $f(x)$ is represented by the given graph:



(A) 0

(B) −1

(C) 3

(D) 1

(E) The limit does not exist.

6. Given the function

$$f(x)=\begin{cases}\sin 2x, & x\le \pi\\ 2x+k, & x>\pi\end{cases}$$

what value of k will make this piecewise function continuous?

(A) -2π

(B) $-\pi$

(C) 0

(D) π

(E) 2π

7. Find the limit, if it exists: $\lim_{x\to 0} x\left(e^x+\dfrac{1}{x}\right)$.

(A) 0

(B) 1

(C) 2

(D) The limit does not exist.

(E) None of these

8. 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) $y=-2$

9. If $p(x)$ is a continuous function on the closed interval [1, 3], with $p(1) \le K \le p(3)$ and c is in the closed interval [1, 3], then which of the following statements must be true?

(A) $p(c) = \dfrac{p(3) + p(1)}{2}$

(B) $p(c) = \dfrac{p(3) - p(1)}{2}$

(C) There is at least one value c such that $p(c) = K$.

(D) There is only one value c such that $p(c) = K$.

(E) $c = 2$

10. How many vertical asymptotes exist for the function $f(x) = \dfrac{1}{2\sin^2 x - \sin x - 1}$ in the open interval $0 < x < 2\pi$?

(A) 0

(B) 1

(C) 2

(D) 3

(E) 4

x	1	2	3	4
$f(x)$	4	2	3	1
$g(x)$	2	3	1	4

11. Selected values for continuous functions $f(x)$ and $g(x)$ are given in the table above. $\lim\limits_{x \to 3} \dfrac{f(g(x))}{g(f(x))} =$

(A) $\dfrac{1}{4}$

(B) $\dfrac{1}{3}$

(C) 1

(D) 3

(E) 4

12. $\lim\limits_{x \to \infty} \dfrac{\sin x}{e^x + \cos x} =$

(A) -1

(B) 0

(C) $\dfrac{1}{e}$

(D) 1

(E) The limit does not exist.

13. 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 $x = -3$?

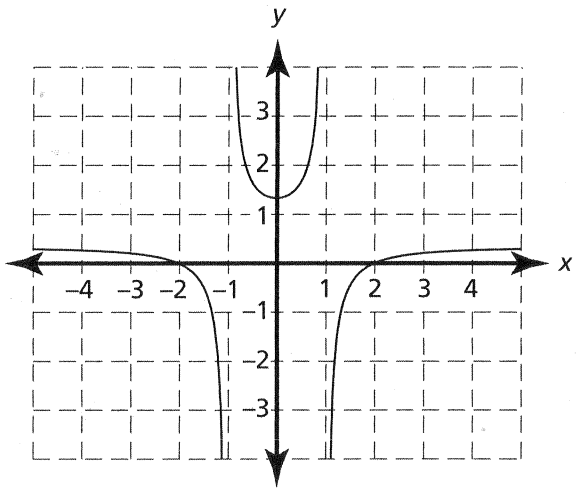
(A) $-\dfrac{7}{6}$

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

(C) 0

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

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



14. 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) $a = 4,\ b = 3$

15. Which of the following statements is true?

(A) $\lim\limits_{x \to 3} \log_3 x = 2$

(B) $\lim\limits_{x \to 0^+} \log_3 x$ does not exist.

(C) $\lim\limits_{x \to -\infty} e^x$ does not exist.

(D) $\lim\limits_{x \to -\frac{\pi}{2}} \csc x = 1$

(E) $\lim\limits_{x \to 1} e^{x-1} = 0$