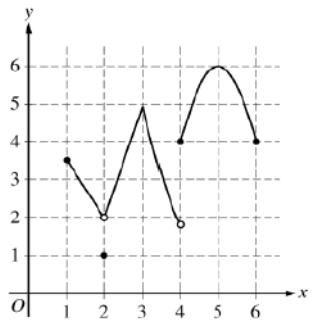
AP Calculus – Multiple Choice Post Exam Set #4

Limits / Continuity/ Differentiability

No Calculator – You will have just under 2 minutes per question.

1.) The graph of the function *f* is shown. Which of the following statements is false? [#5]

(A) $\lim_{x\to 2} f(x)$ exists	(B) $\lim_{x\to 3} f(x)$ exists
(C) $\lim_{x\to 4} f(x)$ exists	(D) $\lim_{x\to 5} f(x)$ exists
(E) The function *f* is continuous at $x = 3$.	



Graph of *f*

$$f(x) = \begin{cases} \dfrac{2x+1 \quad x-2}{x-2} & \text{for} \quad x \neq 2 \\ k & \text{for} \quad x = 2 \end{cases}$$

2.) Let f be the function defined above. For what value of k is f continuous at x = 2 ? [#9]

(A) 0	(B) 1	(C) 2	(D) 3	(E) 5

3.) Let *f* be the function defined by $f(x) = \sqrt{|x-2|}$ for all *x*. Which of the following statements is true? [#11]

(A) *f* is continuous but not differentiable at $x = 2$.
(B) *f* is differentiable at $x = 2$.
(C) *f* is not continuous at $x = 2$.
(D) $\lim_{x\to 2} f(x) \neq 0$
(E) $x = 2$ is a vertical asymptote of the graph of *f*.

4.) $\lim_{h\to 0} \dfrac{\ln\ 4+h\ -\ln\ 4}{h} =$ [#18]

a.) 0	b.) $\frac{1}{4}$	c.) 1	d.) e	e.) nonexistent

5.) Let $f(x) = \ 2x+1\ ^3$ and let *g* be the inverse function of *f*. Given that $f(0) = 1$, what is the value of $g'(1)$? [#20]

(A) $-\frac{2}{27}$	(B) $\frac{1}{54}$	(C) $\frac{1}{27}$	(D) $\frac{1}{6}$	(E) 6

6.) The line $y = 5$ is a horizontal asymptote to the graph of which of the following functions? [#21]

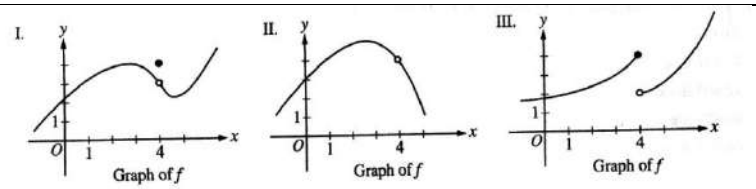
(A) $y = \dfrac{\sin(5x)}{x}$	(B) $y = 5x$	(E) $y = \dfrac{20x^2 - x}{1+4x^2}$
(C) $y = \dfrac{1}{x-5}$	(D) $y = \dfrac{5x}{1-x}$	

7.) Let *f* be a function that is continuous on the closed interval $[2, 4]$ with $f(2) = 10$ and $f(4) = 20$. Which of the following is guaranteed by the Intermediate Value Theorem? [#77]

(A) $f(x) = 13$ has at least one solution in the open interval (2, 4).
(B) $f(3) = 15$
(C) *f* attains a maximum on the open interval (2, 4).
(D) $f'(x) = 5$ has at least one solution in the open interval (2, 4).

(E) $f'(x) > 0$ for all x in the open interval (2, 4).

Practice Problems



1.) For which of the following does $\lim_{x \to 4} f(x)$ exist? (2003-79)

(A) I only (B) II only (C) III only
(D) I and II only (E) I and III only

2.) $\lim_{x \to \infty} \dfrac{x^3 - 2x^2 + 3x - 4}{4x^3 - 3x^2 + 2x - 1} =$ (2003-6)

(A) 4 (B) 1 (C) $\dfrac{1}{4}$ (D) 0 (E) -1

3.) For $x \geq 0$, the horizontal line $y = 2$ is an asymptote for the graph of the function f. Which of the following statements must be true? (2003-3)

(A) $f(0) = 2$	(B) $f(x) \neq 2$ for all $x \geq 0$
(C) $f(2)$ is undefined	(D) $\lim_{x \to 2} f(x) = \infty$
(E) $\lim_{x \to \infty} f(x) = 2$	

4.) Let f be a differentiable function with $f(2) = 3$ and $f'(2) = -5$, and let g be the function defined by $g(x) = x f(x)$. Which of the following is an equation of the line tangent to the graph of g at the point where $x = 2$?

(A) $y = 3x$	(B) $y - 3 = -5(x - 2)$
(C) $y - 6 = -5(x - 2)$	(D) $y - 6 = -7(x - 2)$
(E) $y - 6 = -10(x - 2)$	

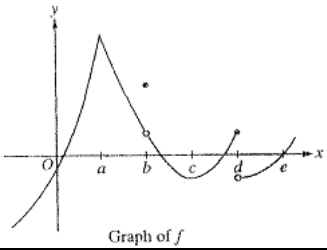
(2003-89)

$$f(x) = \begin{cases} x + 2 & \text{if } x \leq 3 \\ 4x - 7 & \text{if } x > 3 \end{cases}$$

5.) Let f be the function given above. Which of the following statements are true about f?

I. $\lim_{x \to 3} f(x)$ exists.
II. f is continuous at $x = 3$.
III. f is differentiable at $x = 3$.

(A) None (B) I only (C) II only
(D) I and II only (E) I, II, and III
(2003-20)



Graph of f

6.) The graph of a function f is shown above. At which value of x is f continuous, but not differentiable?

(A) a (B) b (C) c (D) d (E) e
(2003-13)