AB: MC Practice Questions
TEST 2: Derivatives and Diff'ability
NO CALCULATOR

1.

Which of the following defines a function f for which $f(-x) = -f(x)$?

(A) $f(x) = x^2$ (B) $f(x) = \sin x$ (C) $f(x) = \cos x$

(D) $f(x) = \log x$ (E) $f(x) = e^x$

2.

$\ln(x-2) < 0$ if and only if

(A) $x < 3$ (B) $0 < x < 3$ (C) $2 < x < 3$

(D) $x > 2$ (E) $x > 3$

3.

If $\begin{cases} f(x) = \dfrac{\sqrt{2x+5} - \sqrt{x+7}}{x-2}, & \text{for } x \neq 2, \\ f(2) = k \end{cases}$ and if f is continuous at $x = 2$, then $k =$

(A) 0 (B) $\frac{1}{6}$ (C) $\frac{1}{3}$ (D) 1 (E) $\frac{7}{5}$

4.

If $f(x) = 2 + |x-3|$ for all x, then the value of the derivative $f'(x)$ at $x = 3$ is

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

5.

If $f(x) = x^{\frac{1}{3}}(x-2)^{\frac{2}{3}}$ for all x, then the domain of f' is

(A) $\{x \mid x \neq 0\}$ (B) $\{x \mid x > 0\}$ (C) $\{x \mid 0 \leq x \leq 2\}$

(D) $\{x \mid x \neq 0 \text{ and } x \neq 2\}$ (E) $\{x \mid x \text{ is a real number}\}$

6.

If the solutions of $f(x)=0$ are -1 and 2, then the solutions of $f\left(\frac{x}{2}\right)=0$ are

(A) -1 and 2 (B) $-\frac{1}{2}$ and $\frac{5}{2}$ (C) $-\frac{3}{2}$ and $\frac{3}{2}$

(D) $-\frac{1}{2}$ and 1 (E) -2 and 4

7.

$\lim\limits_{n\to\infty} \frac{4n^2}{n^2+10,000n}$ is

(A) 0 (B) $\frac{1}{2,500}$ (C) 1 (D) 4 (E) nonexistent

8.

If $f(x)=x$, then $f'(5)=$

(A) 0 (B) $\frac{1}{5}$ (C) 1 (D) 5 (E) $\frac{25}{2}$

9.

If $f(x)=e^x$, which of the following is equal to $f'(e)$?

(A) $\lim\limits_{h\to 0} \frac{e^{x+h}}{h}$ (B) $\lim\limits_{h\to 0} \frac{e^{x+h}-e^e}{h}$ (C) $\lim\limits_{h\to 0} \frac{e^{e+h}-e}{h}$

(D) $\lim\limits_{h\to 0} \frac{e^{x+h}-1}{h}$ (E) $\lim\limits_{h\to 0} \frac{e^{e+h}-e^e}{h}$

10.

Which of the following functions are continuous for all real numbers x?

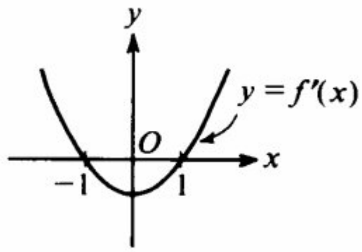
I. $y=x^{\frac{2}{3}}$

II. $y=e^x$

III. $y=\tan x$

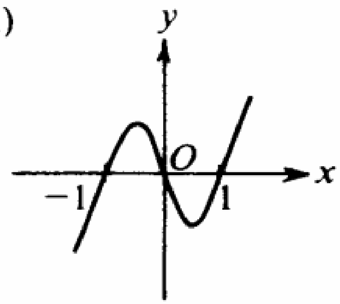
(A) None (B) I only (C) II only (D) I and II (E) I and III

11.

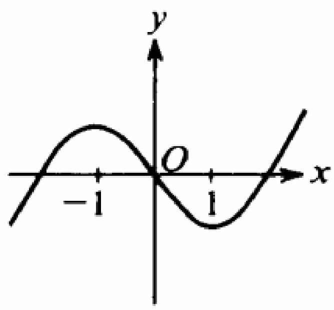


The graph of the <u>derivative</u> of f is shown in the figure above. Which of the following could be the graph of f?

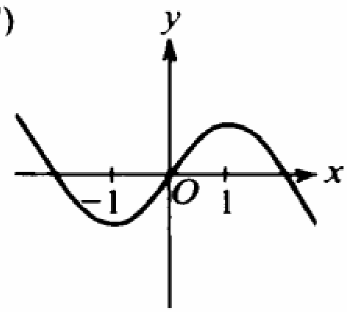
(A)



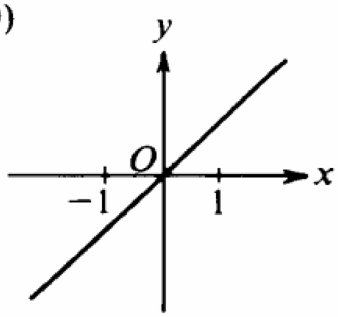
(B)



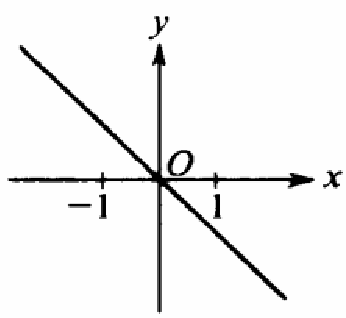
(C)



(D)



(E)



12.

If $\lim_{x \to a} f(x) = L$, where L is a real number, which of the following must be true?

(A) $f'(a)$ exists.

(B) $f(x)$ is continuous at $x = a$.

(C) $f(x)$ is defined at $x = a$.

(D) $f(a) = L$

(E) None of the above

13.

If $f(x)=\sqrt{2x}$, then $f'(2)=$

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\frac{\sqrt{2}}{2}$ (D) 1 (E) $\sqrt{2}$

14.

At $x=3$, the function given by $f(x)=\begin{cases} x^2, & x<3 \\ 6x-9, & x\geq 3 \end{cases}$ is

(A) undefined.

(B) continuous but not differentiable.

(C) differentiable but not continuous.

(D) neither continuous nor differentiable.

(E) both continuous and differentiable.

15.

If $\lim_{x\to 3} f(x)=7$, which of the following must be true?

I. f is continuous at $x=3$.

II. f is differentiable at $x=3$.

III. $f(3)=7$

(A) None (B) II only (C) III only

(D) I and III only (E) I, II, and III

16.

If the function f is continuous for all real numbers and if $f(x)=\frac{x^2-4}{x+2}$ when $x\neq -2$, then $f(-2)=$

(A) –4 (B) –2 (C) –1 (D) 0 (E) 2

17.

$\lim_{\theta \to 0} \frac{1-\cos\theta}{2\sin^2\theta}$ is

(A) 0 (B) $\frac{1}{8}$ (C) $\frac{1}{4}$ (D) 1 (E) nonexistent

18.

If f is a differentiable function, then $f'(a)$ is given by which of the following?

I. $\lim_{h \to 0} \frac{f(a+h)-f(a)}{h}$

II. $\lim_{x \to a} \frac{f(x)-f(a)}{x-a}$

III. $\lim_{x \to a} \frac{f(x+h)-f(x)}{h}$

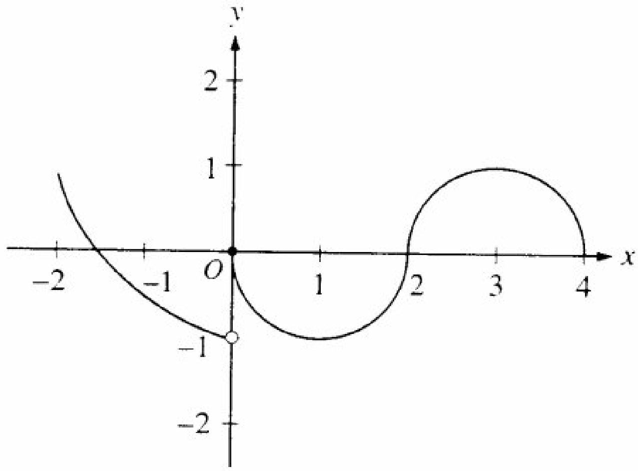
(A) I only (B) II only (C) I and II only (D) I and III only (E) I, II, and III

19.

$\lim_{x \to 1} \frac{x}{\ln x}$ is

(A) 0 (B) $\frac{1}{e}$ (C) 1 (D) e (E) nonexistent

20.



The graph of the function f shown in the figure above has a vertical tangent at the point $(2,0)$ and horizontal tangents at the points $(1,-1)$ and $(3,1)$. For what values of x, $-2 < x < 4$, is f not differentiable?

(A) 0 only (B) 0 and 2 only (C) 1 and 3 only (D) 0, 1, and 3 only (E) 0, 1, 2, and 3

21.

x	0	1	2
$f(x)$	1	k	2

The function f is continuous on the closed interval $[0,2]$ and has values that are given in the table above. The equation $f(x)=\frac{1}{2}$ must have at least two solutions in the interval $[0,2]$ if $k =$

(A) 0 (B) $\frac{1}{2}$ (C) 1 (D) 2 (E) 3

21. Find the values of a and b such that $f(x)=\begin{cases} 5x+2, & x<1 \\ ax^2+bx, & x\geq 1 \end{cases}$ is differentiable for all x.

(A) $a=1,\ b=2$ (B) $a=4,\ b=-7$ (C) $a=-2,\ b=9$
(D) $a=-5,\ b=0$ (E) no such values exist