

Ch 5 MC AP Problems

1.

$$\int_0^8 \frac{dx}{\sqrt{1+x}} =$$

- (A) 1 (B) $\frac{3}{2}$ (C) 2 (D) 4 (E) 6

2.

The set of all points (e^t, t) , where t is a real number, is the graph of $y =$

- (A) $\frac{1}{e^x}$ (B) e^x (C) xe^x (D) $\frac{1}{\ln x}$ (E) $\ln x$

3.

A point moves on the x -axis in such a way that its velocity at time t ($t > 0$) is given by $v = \frac{\ln t}{t}$.

At what value of t does v attain its maximum?

- (A) 1 (B) $e^{\frac{1}{2}}$ (C) e (D) $e^{\frac{3}{2}}$
- (E) There is no maximum value for v .

4.

At $x = 0$, which of the following is true of the function f defined by $f(x) = x^2 + e^{-2x}$?

- (A) f is increasing.
 (B) f is decreasing.
 (C) f is discontinuous.
 (D) f has a relative minimum.
 (E) f has a relative maximum.

5.

$$\frac{d}{dx}(\ln e^{2x}) =$$

- (A) $\frac{1}{e^{2x}}$ (B) $\frac{2}{e^{2x}}$ (C) $2x$ (D) 1 (E) 2

6.

The area of the region bounded by the curve $y = e^{2x}$, the x -axis, the y -axis, and the line $x = 2$ is equal to

- (A) $\frac{e^4}{2} - e$ (B) $\frac{e^4}{2} - 1$ (C) $\frac{e^4}{2} - \frac{1}{2}$
(D) $2e^4 - e$ (E) $2e^4 - 2$

7.

If $\sin x = e^y$, $0 < x < \pi$, what is $\frac{dy}{dx}$ in terms of x ?

- (A) $-\tan x$ (B) $-\cot x$ (C) $\cot x$ (D) $\tan x$ (E) $\csc x$

8.

A region in the plane is bounded by the graph of $y = \frac{1}{x}$, the x -axis, the line $x = m$, and the line $x = 2m$, $m > 0$. The area of this region

- (A) is independent of m .
(B) increases as m increases.
(C) decreases as m increases.
(D) decreases as m increases when $m < \frac{1}{2}$; increases as m increases when $m > \frac{1}{2}$.
(E) increases as m increases when $m < \frac{1}{2}$; decreases as m increases when $m > \frac{1}{2}$.

9.

$$\int_{\pi/4}^{\pi/2} \frac{\cos x}{\sin x} dx =$$

- (A) $\ln \sqrt{2}$ (B) $\ln \frac{\pi}{4}$ (C) $\ln \sqrt{3}$ (D) $\ln \frac{\sqrt{3}}{2}$ (E) $\ln e$

10.

If $f'(x) = -f(x)$ and $f(1) = 1$, then $f(x) =$

- (A) $\frac{1}{2}e^{-2x+2}$ (B) e^{-x-1} (C) e^{1-x} (D) e^{-x} (E) $-e^x$

11.

$$\int \frac{x^2}{e^{x^3}} dx =$$

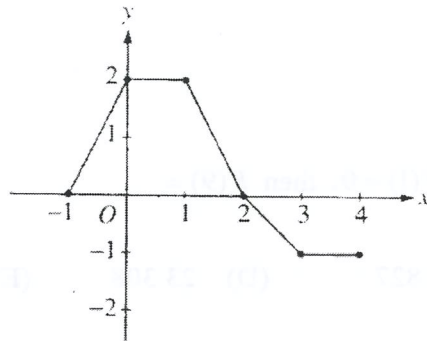
- (A) $-\frac{1}{3} \ln e^{x^3} + C$ (B) $-\frac{e^{x^3}}{3} + C$ (C) $-\frac{1}{3e^{x^3}} + C$
- (D) $\frac{1}{3} \ln e^{x^3} + C$ (E) $\frac{x^3}{3e^{x^3}} + C$

12.

If n is a non-negative integer, then $\int_0^1 x^n dx = \int_0^1 (1-x)^n dx$ for

- (A) no n (B) n even, only (C) n odd, only
- (D) nonzero n , only (E) all n

13.



The graph of a piecewise-linear function f , for $-1 \leq x \leq 4$, is shown above. What is the value of

$$\int_{-1}^4 f(x) dx?$$

- (A) 1 (B) 2.5 (C) 4 (D) 5.5 (E) 8

14.

$$\int_1^e \left(\frac{x^2 - 1}{x} \right) dx =$$

- (A) $e - \frac{1}{e}$ (B) $e^2 - e$ (C) $\frac{e^2}{2} - e + \frac{1}{2}$ (D) $e^2 - 2$ (E) $\frac{e^2}{2} - \frac{3}{2}$

15.

If $f(x) = \sin(e^{-x})$, then $f'(x) =$

- (A) $-\cos(e^{-x})$
- (B) $\cos(e^{-x}) + e^{-x}$
- (C) $\cos(e^{-x}) - e^{-x}$
- (D) $e^{-x} \cos(e^{-x})$
- (E) $-e^{-x} \cos(e^{-x})$

16.

Let f be the function given by $f(x) = 3e^{2x}$ and let g be the function given by $g(x) = 6x^3$. At what value of x do the graphs of f and g have parallel tangent lines?

- (A) -0.701
- (B) -0.567
- (C) -0.391
- (D) -0.302
- (E) -0.258

17.

Let $F(x)$ be an antiderivative of $\frac{(\ln x)^3}{x}$. If $F(1) = 0$, then $F(9) =$

- (A) 0.048
- (B) 0.144
- (C) 5.827
- (D) 23.308
- (E) 1,640.250

18.

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

- (A) $x < 3$
- (B) $0 < x < 3$
- (C) $2 < x < 3$
- (D) $x > 2$
- (E) $x > 3$

19.

If the function f is defined by $f(x) = x^5 - 1$, then f^{-1} , the inverse function of f , is defined by $f^{-1}(x) =$

- (A) $\frac{1}{\sqrt[5]{x+1}}$
- (B) $\frac{1}{\sqrt[5]{x-1}}$
- (C) $\sqrt[5]{x-1}$
- (D) $\sqrt[5]{x} - 1$
- (E) $\sqrt[5]{x+1}$

25.

$$\lim_{h \rightarrow 0} \frac{1}{h} \ln \left(\frac{2+h}{2} \right) \text{ is}$$

- (A) e^2 (B) 1 (C) $\frac{1}{2}$ (D) 0 (E) nonexistent

26.

Let $f(x) = \cos(\arctan x)$. What is the range of f ?

- (A) $\left\{ x \mid -\frac{\pi}{2} < x < \frac{\pi}{2} \right\}$ (B) $\{x \mid 0 < x \leq 1\}$ (C) $\{x \mid 0 \leq x \leq 1\}$
(D) $\{x \mid -1 < x < 1\}$ (E) $\{x \mid -1 \leq x \leq 1\}$

27.

$$\text{If } y = e^{nx}, \text{ then } \frac{d^n y}{dx^n} =$$

- (A) $n^n e^{nx}$ (B) $n! e^{nx}$ (C) $n e^{nx}$ (D) $n^n e^x$ (E) $n! e^x$

28.

If $\frac{dy}{dx} = 4y$ and if $y = 4$ when $x = 0$, then $y =$

- (A) $4e^{4x}$ (B) e^{4x} (C) $3 + e^{4x}$ (D) $4 + e^{4x}$ (E) $2x^2 + 4$

29.

If $y = \arctan(\cos x)$, then $\frac{dy}{dx} =$

- (A) $\frac{-\sin x}{1 + \cos^2 x}$ (B) $-(\operatorname{arcsec}(\cos x))^2 \sin x$ (C) $(\operatorname{arcsec}(\cos x))^2$
(D) $\frac{1}{(\arccos x)^2 + 1}$ (E) $\frac{1}{1 + \cos^2 x}$

30.

$$\int_1^2 \frac{x^2-1}{x+1} dx =$$

- (A) $\frac{1}{2}$ (B) 1 (C) 2 (D) $\frac{5}{2}$ (E) $\ln 3$

31.

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

- (A) $\lim_{h \rightarrow 0} \frac{e^{x+h}}{h}$ (B) $\lim_{h \rightarrow 0} \frac{e^{x+h} - e^e}{h}$ (C) $\lim_{h \rightarrow 0} \frac{e^{e+h} - e}{h}$
(D) $\lim_{h \rightarrow 0} \frac{e^{x+h} - 1}{h}$ (E) $\lim_{h \rightarrow 0} \frac{e^{e+h} - e^e}{h}$

32.

If $y = x^2 e^x$, then $\frac{dy}{dx} =$

- (A) $2xe^x$ (B) $x(x + 2e^x)$ (C) $xe^x(x + 2)$
(D) $2x + e^x$ (E) $2x + e$

33.

If $\ln x - \ln\left(\frac{1}{x}\right) = 2$, then $x =$

- (A) $\frac{1}{e^2}$ (B) $\frac{1}{e}$ (C) e (D) $2e$ (E) e^2

34.

$$\frac{d}{dx}(x^{\ln x}) =$$

- (A) $x^{\ln x}$ (B) $(\ln x)^x$ (C) $\frac{2}{x}(\ln x)(x^{\ln x})$ (D) $(\ln x)(x^{\ln x - 1})$ (E) $2(\ln x)(x^{\ln x})$

35.

For $x > 0$, $\int \left(\frac{1}{x} \int_1^x \frac{du}{u} \right) dx =$

- (A) $\frac{1}{x^3} + C$ (B) $\frac{8}{x^4} - \frac{2}{x^2} + C$ (C) $\ln(\ln x) + C$
(D) $\frac{\ln(x^2)}{2} + C$ (E) $\frac{(\ln x)^2}{2} + C$

36.

If $f(x) = e^{3\ln(x^2)}$, then $f'(x) =$

- (A) $e^{3\ln(x^2)}$ (B) $\frac{3}{x^2} e^{3\ln(x^2)}$ (C) $6(\ln x) e^{3\ln(x^2)}$ (D) $5x^4$ (E) $6x^5$

37.

Suppose that f is a function that is defined for all real numbers. Which of the following conditions assures that f has an inverse function?

- (A) The function f is periodic.
(B) The graph of f is symmetric with respect to the y -axis.
(C) The graph of f is concave up.
(D) The function f is a strictly increasing function.
(E) The function f is continuous.

40.

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.

38.

Let f and g be functions that are differentiable everywhere. If g is the inverse function of f and

if $g(-2) = 5$ and $f'(5) = -\frac{1}{2}$, then $g'(-2) =$

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

39.

$\int_1^{500} (13^x - 11^x) dx + \int_2^{500} (11^x - 13^x) dx =$

- (A) 0.000 (B) 14.946 (C) 34.415 (D) 46.000 (E) 136.364