AP Multiple Choice Questions
1988

1.

If $x + 7y = 29$ is an equation of the line normal to the graph of f at the point $(1, 4)$, then $f'(1) =$

(A) 7 (B) $\frac{1}{7}$ (C) $-\frac{1}{7}$ (D) $-\frac{7}{29}$ (E) -7

2.

. A particle travels in a straight line with a constant acceleration of 3 meters per second per second. If the velocity of the particle is 10 meters per second at time 2 seconds, how far does the particle travel during the time interval when its velocity increases from 4 meters per second to 10 meters per second?

(A) 20 m (B) 14 m (C) 7 m (D) 6 m (E) 3 m

3.

A polynomial $p(x)$ has a relative maximum at $(-2, 4)$, a relative minimum at $(1, 1)$, a relative maximum at $(5, 7)$, and no other critical points. How many real zeros does $p(x)$ have?

(A) One (B) Two (C) Three (D) Four (E) Five

4.

The average value of $\frac{1}{x}$ on the closed interval $[1, 3]$ is

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

5.

If c is the number that satisfies the conclusion of the Mean Value Theorem for $f(x) = x^3 - 2x^2$ on the interval $0 \leqq x \leqq 2$, then $c =$

(A) 0 (B) $\frac{1}{2}$ (C) 1 (D) $\frac{4}{3}$ (E) 2

6.

The base of a solid is the region in the first quadrant enclosed by the parabola $y = 4x^2$, the line $x = 1$, and the x-axis. Each plane section of the solid perpendicular to the x-axis is a square. The volume of the solid is

(A) $\frac{4\pi}{3}$ (B) $\frac{16\pi}{5}$ (C) $\frac{4}{3}$ (D) $\frac{16}{5}$ (E) $\frac{64}{5}$

7.

If the graph of $y = x^3 + ax^2 + bx - 4$ has a point of inflection at $(1, -6)$, what is the value of b?

(A) -3 (B) 0 (C) 1 (D) 3

(E) It cannot be determined from the information given.

8.

The region R in the first quadrant is enclosed by the lines $x = 0$ and $y = 5$ and the graph of $y = x^2 + 1$. The volume of the solid generated when R is revolved about the y-axis is

(A) 6π (B) 8π (C) $\frac{34\pi}{3}$ (D) 16π (E) $\frac{544\pi}{15}$

9.

Let R be the region between the graphs of $y = 1$ and $y = \sin x$ from $x = 0$ to $x = \frac{\pi}{2}$. The volume of the solid obtained by revolving R about the x-axis is given by

(A) $2\pi\int_0^{\frac{\pi}{2}} x \sin x \, dx$ (B) $2\pi\int_0^{\frac{\pi}{2}} x \cos x \, dx$ (C) $\pi\int_0^{\frac{\pi}{2}} (1 - \sin x)^2 \, dx$

(D) $\pi\int_0^{\frac{\pi}{2}} \sin^2 x \, dx$ (E) $\pi\int_0^{\frac{\pi}{2}} (1 - \sin^2 x) \, dx$

10.

The area of the region in the first quadrant enclosed by the graph of $y = x(1 - x)$ and the x-axis is

(A) $\frac{1}{6}$ (B) $\frac{1}{3}$ (C) $\frac{2}{3}$ (D) $\frac{5}{6}$ (E) 1

11.

A person 2 meters tall walks directly away from a streetlight that is 8 meters above the ground. If the person is walking at a constant rate and the person's shadow is lengthening at the rate of $\frac{4}{9}$ meter per second, at what rate, in meters per second, is the person walking?

(A) $\frac{4}{27}$ (B) $\frac{4}{9}$ (C) $\frac{3}{4}$ (D) $\frac{4}{3}$ (E) $\frac{16}{9}$

12.

If $\frac{dy}{dx} = y \sec^2 x$ and $y = 5$ when $x = 0$, then $y =$

(A) $e^{\tan x} + 4$ (B) $e^{\tan x} + 5$ (C) $5e^{\tan x}$

(D) $\tan x + 5$ (E) $\tan x + 5e^x$

13.

. 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

14.

If $\int_1^4 f(x)\,dx = 6$, what is the value of $\int_1^4 f(5-x)\,dx$?

(A) 6 (B) 3 (C) 0 (D) -1 (E) -6

15.

$\frac{d}{dx}\ln\left|\cos\left(\frac{\pi}{x}\right)\right|$ is

(A) $\frac{-\pi}{x^2\cos\left(\frac{\pi}{x}\right)}$ (B) $-\tan\left(\frac{\pi}{x}\right)$ (C) $\frac{1}{\cos\left(\frac{\pi}{x}\right)}$

(D) $\frac{\pi}{x}\tan\left(\frac{\pi}{x}\right)$ (E) $\frac{\pi}{x^2}\tan\left(\frac{\pi}{x}\right)$

16.

Bacteria in a certain culture increase at a rate proportional to the number present. If the number of bacteria doubles in three hours, in how many hours will the number of bacteria triple?

(A) $\frac{3\ln 3}{\ln 2}$ (B) $\frac{2\ln 3}{\ln 2}$ (C) $\frac{\ln 3}{\ln 2}$ (D) $\ln\left(\frac{27}{2}\right)$ (E) $\ln\left(\frac{9}{2}\right)$

17.

$\int_0^1 x(x^2+2)^2\,dx =$

(A) $\frac{19}{2}$ (B) $\frac{19}{3}$ (C) $\frac{9}{2}$ (D) $\frac{19}{6}$ (E) $\frac{1}{6}$

18.

If $f(x) = e^x$, then $\ln[f'(2)] =$

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

19.

Let f be the function defined by the following.

$$f(x) = \begin{cases} \sin x, & x < 0 \\ x^2, & 0 \leqq x < 1 \\ 2 - x, & 1 \leqq x < 2 \\ x - 3, & x \geqq 2 \end{cases}$$

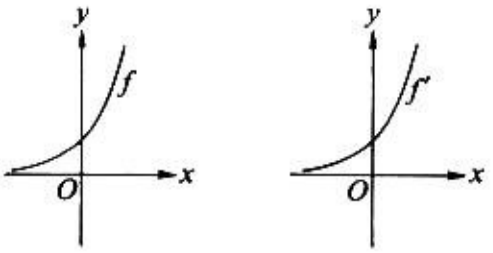
For what values of x is f NOT continuous?

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

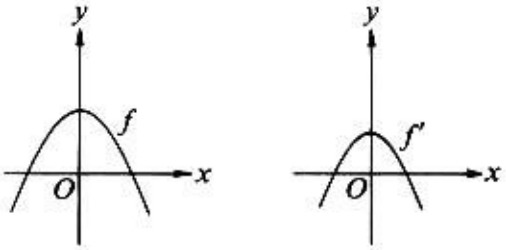
20.

Which of the following pairs of graphs could represent the graph of a function and the graph of its derivative?

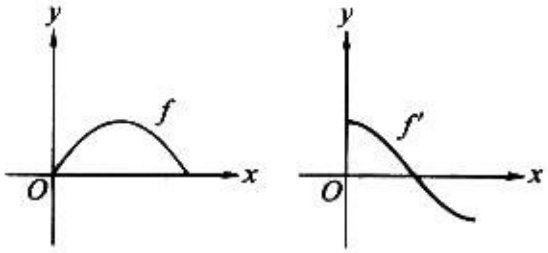
I.



II.



III.



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

21.

If $y^2 - 2xy = 16$, then $\frac{dy}{dx} =$

(A) $\frac{x}{y - x}$ (B) $\frac{y}{x - y}$ (C) $\frac{y}{y - x}$ (D) $\frac{y}{2y - x}$ (E) $\frac{2y}{x - y}$

22.

$\lim_{h \to 0} \frac{\sin(x + h) - \sin x}{h}$ is

(A) 0 (B) 1 (C) $\sin x$ (D) $\cos x$ (E) nonexistent

23.

If $F(x) = \int_1^{x^2} \sqrt{1 + t^3}\, dt$, then $F'(x) =$

(A) $2x\sqrt{1 + x^6}$ (B) $2x\sqrt{1 + x^3}$ (C) $\sqrt{1 + x^6}$

(D) $\sqrt{1 + x^3}$ (E) $\int_1^{x^2} \frac{3t^2}{2\sqrt{1 + t^3}}\, dt$

24.

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

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