29. Given $y = x^4 - 6x^3 - 24x^2 + 10$, for which of the following values of x does the graph of y have a point of inflection?

(A) 1
(B) 2
(C) 3
(D) 4

30. $\int_0^1 \tan x \, dx =$

(A) 0
(B) ln(cos(1))
(C) ln(sec(1))
(D) ln(sec(1)) – 1

LIVEWORKSHEETS

Section I

34. If f is defined by $f(x) = x + e^{-x^2}$ on the interval $[0, 10]$, then f has a point of inflection at which of the following values of x?

(A) 0.379
(B) 0.5
(C) 0.707
(D) 0.947

35. Estimate $\int_0^2 3e^x + 1\,dx$ using a Riemann sum with $n = 4$ right-hand rectangles.

(A) 26.357
(B) 33.546
(C) 52.713
(D) 56.713

36. The volume generated by revolving about the x-axis the region above the curve $y = x^3$, below the line $y = 1$, and between $x = 0$ and $x = 1$ is

(A) $\frac{\pi}{42}$

(B) 0.143π

(C) 0.643π

(D) $\frac{6\pi}{7}$

LIVEWORKSHEETS

Section I

37. Given two numbers x and y, such that $x^2 + y = 48$, what is maximum value of the product of the two numbers, P?

(A) 4
(B) 32
(C) 128
(D) 512

38. The function f is given by $f(x) = 2x^3 - 5$ on the interval $[1, 5]$. Which of the following is a possible value of c guaranteed by the Mean Value Theorem on the interval $(1, 5)$?

(A) 3.136
(B) 3.215
(C) 3.225
(D) 4.160

39. Find two non-negative numbers x and y whose sum is 100 and for which x^2y is a maximum.

(A) $x = 50$ and $y = 50$
(B) $x = 33.333$ and $y = 66.667$
(C) $x = 100$ and $y = 0$
(D) $x = 66.667$ and $y = 33.333$

LIVEWORKSHEETS

Section I

21. If $y=\left(x^4+\sin x\right)^6$, then $\frac{dy}{dx}=$

(A) $6\left(x^4+\sin x\right)^6\left(4x^3-\cos x\right)$

(B) $6\left(x^4+\sin x\right)^5\left(4x^3+\cos x\right)$

(C) $6\left(4x^3+\cos x\right)^5$

(D) $6\left(4x^3-\cos x\right)^5$

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22. Find the slope of the normal line to $y = x + \cos xy$ at (0, 1).

(A) –1
(B) 1
(C) 0
(D) Undefined

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23. $\int \frac{\csc^2\left(\sqrt{x}\right)}{\sqrt{x}}dx=$

(A) $2\cot\sqrt{x}+C$

(B) $-2\cot\sqrt{x}+C$

(C) $\frac{\csc^2\sqrt{x}}{3\sqrt{x}}+C$

(D) $\frac{\csc^2\sqrt{x}}{6\sqrt{x}}+C$

LIVEWORKSHEETS

Section I

40. An object is moving along a line with its velocity given by $v(t) = t^2 \sin t$, for time $t \geq 0$. If the object's position at time $t = 0$ is 4, what is its position at time $t = 2$?

(A) 0.469
(B) 2.469
(C) 4.469
(D) 6.469

41. $\int \sin^4(\pi x)\cos(\pi x)\,dx =$

(A) $\frac{\sin^5(\pi x)}{5\pi} + C$

(B) $\frac{\sin^5(\pi x)}{2\pi} + C$

(C) $-\frac{\cos^5(\pi x)}{5\pi} + C$

(D) $-\frac{\cos^5(\pi x)}{2\pi} + C$

LIVEWORKSHEETS

42. A balloon is inflating at the rate $\frac{dV}{dt} = 300 - t \ln t$ cubic inches per second, where t is the number of seconds that the balloon has been inflating. If the initial volume of the balloon is 100 cubic inches, what is the volume of the balloon after it has been inflating for 8 seconds, to the nearest 10 cubic inches?

(A) 150 cubic inches
(B) 280 cubic inches
(C) 320 cubic inches
(D) 2450 cubic inches

43. If $x^2 + 3x^2y + y^3 = 13$, find $\frac{dy}{dx}$ at (2, 1).

(A) $-\frac{16}{15}$

(B) $-\frac{4}{15}$

(C) $\frac{16}{15}$

(D) $\frac{19}{15}$

LIVEWORKSHEETS

24. $\lim_{x \to 0} \frac{\tan^3(2x)}{x^3} =$

(A) –8
(B) 2
(C) 8
(D) The limit does not exist.

25. Find the value of c that satisfies the Mean Value Theorem if $f(x) = 2x^3 - 4x + 1$ on the interval $[1, 2]$.

(A) 1
(B) $\sqrt{2}$
(C) $\sqrt{\frac{7}{3}}$
(D) There is no value of c in the interval.

26. If $y = \left(\frac{x^3 - 2}{2x^5 - 1}\right)^4$, find $\frac{dy}{dx}$ at $x = 1$.

(A) –52
(B) –28
(C) 13
(D) 52

LIVEWORKSHEETS

Section I

27. $\int x\sqrt{5-x}\,dx =$

(A) $-\frac{10}{3}(5-x)^{\frac{3}{2}}$

(B) $\frac{10}{3}\sqrt{\frac{5x^2}{2}-\frac{x^3}{3}}+C$

(C) $10(5-x)^{\frac{1}{2}}+\frac{2}{3}(5-x)^{\frac{3}{2}}+C$

(D) $-\frac{10}{3}(5-x)^{\frac{3}{2}}+\frac{2}{5}(5-x)^{\frac{5}{2}}+C$

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28. Given the differential equation $\frac{dy}{dt}=-2y$, where $y(0) = 100$, find $y(2)$.

(A) –200

(B) –4

(C) $\frac{100}{e^{16}}$

(D) $\frac{100}{e^{4}}$

LIVEWORKSHEETS

32. $\frac{d}{dx}\int_0^{x^2} \sin^2 t\, dt =$

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

33. Given $y = x^{\cos 4x}$, find $\frac{dy}{dx}$.

(A) $\frac{dy}{dx} = x^{\cos 4x}\left[-\left(\frac{1}{x}\right)(4\sin 4x)\right]$

(B) $\frac{dy}{dx} = x^{\cos 4x}\left[(\cos 4x)\left(\frac{1}{x}\right) - \ln x(4\sin 4x)\right]$

(C) $\frac{dy}{dx} = (\cos 4x)x^{(\cos 4x)-1}$

(D) $\frac{dy}{dx} = \left[(\cos 4x)x^{(\cos 4x)-1}\right](-4\sin 4x)$

LIVEWORKSHEETS

Section I

44. Find the equation of the line tangent to $y = x\tan x$ at $x = 1$.

(A) $y = 4.983x + 3.426$
(B) $y = 4.983x - 3.426$
(C) $y = 4.983x + 6.540$
(D) $y = 4.983x - 6.540$

45. If $f(x)$ is continuous and differentiable and $f(x) = \begin{cases} ax^4 + 5x; x \le 2 \\ bx^2 - 3x; x > 2 \end{cases}$, then $b =$

(A) 0
(B) 2
(C) 6
(D) There is no value of b.

LIVEWORKSHEETS

CALCULUS AB

SECTION I, Part B

Time—45 Minutes

Number of questions—15

A GRAPHING CALCULATOR IS REQUIRED FOR SOME QUESTIONS ON THIS PART OF THE EXAMINATION

Directions: Solve each of the following problems, using the available space for scratchwork. After examining the form of the choices, decide which is the best of the choices given and fill in the corresponding oval on the answer sheet. No credit will be given for anything written in the test book. Do not spend too much time on any one problem.

In this test:

1. The **exact** numerical value of the correct answer does not always appear among the choices given. When this happens, select from among the choices the number that best approximates the exact numerical value.
2. Unless otherwise specified, the domain of a function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number.

31. The graph of $y = \frac{1}{2} + \cos x$ has a zero on the interval $[0, \pi]$. What is the slope of the tangent line to the graph at that point?

(A) $-\frac{\sqrt{3}}{2}$

(B) $-\frac{\sqrt{2}}{2}$

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

(D) $\frac{\sqrt{3}}{2}$

GO ON TO THE NEXT PAGE.

LIVEWORKSHEETS