Part B consists of 17 questions that will be answered on side 2 of the answer sheet. Following are the directions for Section I, Part B.

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.

BE SURE YOU ARE USING SIDE 2 OF THE ANSWER SHEET TO RECORD YOUR ANSWERS TO QUESTIONS NUMBERED 29–45.

YOU MAY NOT RETURN TO SIDE 1 OF THE ANSWER SHEET

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.

Note: Question numbers with an asterisk (*) indicate a graphing calculator-active question.

29. $\int_0^{\frac{\pi}{4}} \sin x\, dx + \int_{-\frac{\pi}{4}}^{0} \cos x\, dx =$

(A) $-\sqrt{2}$ (B) -1 (C) 0 (D) 1 (E) $\sqrt{2}$

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30. Boats A and B leave the same place at the same time. Boat A heads due North at 12 km/hr. Boat B heads due East at 18 km/hr. After 2.5 hours, how fast is the distance between the boats increasing (in km/hr)?

(A) 21.63 (B) 31.20 (C) 75.00 (D) 9.84 (E) 54.08

31. $\lim_{h \to 0} \dfrac{\tan\left(\frac{\pi}{6} + h\right) - \tan\left(\frac{\pi}{6}\right)}{h} =$

(A) $\dfrac{\sqrt{3}}{3}$ (B) $\dfrac{4}{3}$ (C) $\sqrt{3}$ (D) 0 (E) $\dfrac{3}{4}$

32. If $\int_{30}^{100} f(x)dx = A$ and $\int_{50}^{100} f(x)dx = B$, then $\int_{30}^{50} f(x)dx =$

(A) $A + B$ (B) $A - B$ (C) 0 (D) $B - A$ (E) 20

33. If $f(x) = 3x^2 - x$, and $g(x) = f^{-1}(x)$, then $g'(10)$ could be

(A) 59 (B) $\dfrac{1}{59}$ (C) $\dfrac{1}{10}$ (D) 11 (E) $\dfrac{1}{11}$

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34. The graph of $y = x^3 - 5x^2 + 4x + 2$ has a local minimum at

(A) (0.46, 2.87) (B) (0.46, 0) (C) (2.87, –4.06) (D) (4.06, 2.87) (E) (1.66, –0.59)

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35. The volume generated by revolving about the y-axis the region enclosed by the graphs $y = 9 - x^2$ and $y = 9 - 3x$, for $0 \le x \le 2$, is

(A) -8π (B) 4π (C) 8π (D) 24π (E) 48π

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36. The average value of the function $f(x) = \ln^2 x$ on the interval [2, 4] is

(A) –1.204 (B) 1.204 (C) 2.159 (D) 2.408 (E) 8.636

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37. $\frac{d}{dx}\int_0^{3x} \cos(t)dt =$

(A) $\sin 3x$ (B) $-3\sin 3x$ (C) $\cos 3x$ (D) $3\sin 3x$ (E) $3\cos 3x$

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38. If the definite integral $\int_1^3 (x^2+1)dx$ is approximated by using the Trapezoid Rule with $n = 4$, the error is

(A) 0 (B) $\frac{7}{3}$ (C) $\frac{1}{12}$ (D) $\frac{65}{6}$ (E) $\frac{97}{3}$

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39. The radius of a sphere is increasing at a rate proportional to its radius. If the radius is 4 initially, and the radius is 10 after two seconds, what will the radius be after three seconds?

(A) 62.50 (B) 13.00 (C) 15.81 (D) 16.00 (E) 25.00

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40. Use differentials to approximate the change in the volume of a sphere when the radius is increased from 10 to 10.02 cm.

(A) 4213.973 (B) 1261.669 (C) 1256.637 (D) 25.233 (E) 25.133

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41. $\int \ln 2x \; dx =$

(A) $\frac{\ln 2x}{x} + C$

(B) $\frac{\ln 2x}{2x} + C$

(C) $x \ln x - x + C$

(D) $x \ln 2x - x + C$

(E) $2x \ln 2x - 2x + C$

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42. If the function $f(x)$ is continuous and differentiable $= \begin{cases} ax^3 - 6x; & \text{if } x \leq 1 \\ bx^2 + 4; & x > 1 \end{cases}$ then $a =$

(A) 0 (B) 1 (C) −14 (D) −24 (E) 26

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43. Two particles leave the origin at the same time and move along the y-axis with their respective positions determined by the functions $y_1 = \cos 2t$ and $y_2 = 4\sin t$ for $0 < t < 6$. For how many values of t do the particles have the same acceleration?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

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44. Find the distance traveled (to three decimal places) in the first four seconds, for a particle whose velocity is given by $v(t)=7e^{-t^2}$; where t stands for time.

(A) 0.976 (B) 6.204 (C) 6.359 (D) 12.720 (E) 7.000

45. $\int \tan^6 x \sec^2 x\, dx =$

(A) $\frac{\tan^7}{7}+C$

(B) $\frac{\tan^7 x}{7}+\frac{\sec^3 x}{3}+C$

(C) $\frac{\tan^7 x \sec^3 x}{21}+C$

(D) $7\tan^7 x+C$

(E) $\frac{2}{7}\tan^7 x \sec x+C$

STOP

END OF SECTION I

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS SECTION

DO NOT GO ON TO SECTION II UNTIL YOU ARE TOLD TO DO SO

MAKE SURE YOU HAVE PLACED YOUR AP NUMBER LABEL ON YOUR ANSWER SHEET AND HAVE WRITTEN AND GRIDDED YOUR NUMBER CORRECTLY IN SECTION C OF THE ANSWER SHEET