ANSWER SHEET FOR DIAGNOSTIC TEST

Determine the correct answer for each question. Then, using a no. 2 pencil, blacken completely the oval containing the letter of your choice.

1.	(A)	(B)	(C)	(D)	(E)	18.	(A)	(B)	(C)	(D)	(E)	35.	(A)	(B)	(C)	(D)	(E)
2.	(A)	(B)	(C)	(D)	(E)	19.	(A)	(B)	(C)	(D)	(E)	36.	(A)	(B)	(C)	(D)	(E)
3.	(A)	(B)	(C)	(D)	(E)	20.	(A)	(B)	(C)	(D)	(E)	37.	(A)	(B)	(C)	(D)	(E)
4.	(A)	(B)	(C)	(D)	(E)	21.	(A)	(B)	(C)	(D)	(E)	38.	(A)	(B)	(C)	(D)	(E)
5.	(A)	(B)	(C)	(D)	(E)	22.	(A)	(B)	(C)	(D)	(E)	39.	(A)	(B)	(C)	(D)	(E)
6.	(A)	(B)	(C)	(D)	(E)	23.	(A)	(B)	(C)	(D)	(E)	40.	(A)	(B)	(C)	(D)	(E)
7.	(A)	(B)	(C)	(D)	(E)	24.	(A)	(B)	(C)	(D)	(E)	41.	(A)	(B)	(C)	(D)	(E)
8.	(A)	(B)	(C)	(D)	(E)	25.	(A)	(B)	(C)	(D)	(E)	42.	(A)	(B)	(C)	(D)	(E)
9.	(A)	(B)	(C)	(D)	(E)	26.	(A)	(B)	(C)	(D)	(E)	43.	(A)	(B)	(C)	(D)	(E)
10.	(A)	(B)	(C)	(D)	(E)	27.	(A)	(B)	(C)	(D)	(E)	44.	(A)	(B)	(C)	(D)	(E)
11.	(A)	(B)	(C)	(D)	(E)	28.	(A)	(B)	(C)	(D)	(E)	45.	(A)	(B)	(C)	(D)	(E)
12.	(A)	(B)	(C)	(D)	(E)	29.	(A)	(B)	(C)	(D)	(E)	46.	(A)	(B)	(C)	(D)	(E)
13.	(A)	(B)	(C)	(D)	(E)	30.	(A)	(B)	(C)	(D)	(E)	47.	(A)	(B)	(C)	(D)	(E)
14.	(A)	(B)	(C)	(D)	(E)	31.	(A)	(B)	(C)	(D)	(E)	48.	(A)	(B)	(C)	(D)	(E)
15.	(A)	(B)	(C)	(D)	(E)	32.	(A)	(B)	(C)	(D)	(E)	49.	(A)	(B)	(C)	(D)	(E)
16.	(A)	(B)	(C)	(D)	(E)	33.	(A)	(B)	(C)	(D)	(E)	50.	(A)	(B)	(C)	(D)	(E)
17.	(A)	(B)	(C)	(D)	(E)	34.	(A)	(B)	(C)	(D)	(E)						

The diagnostic test is designed to help you pinpoint the weak spots in your background. The answer explanations that follow the test are keyed to sections of the book.

To make the best use of this diagnostic test, set aside between 1 and 2 hours so you will be able to do the whole test at one sitting. Tear out the preceding answer sheet and indicate your answers in the appropriate spaces. Do the problems as if this were a regular testing session. Review the suggestions on pages vii–viii.

When finished, check your answers with those at the end of the test. For those that you got wrong, note the sections containing the material that you must review. If you do not fully understand how you arrived at some of the correct answers, you should review those sections also.

Finally, fill out the self-evaluation sheet on page 21 in order to pinpoint the topics that gave you the most difficulty.

50 questions 1 hour

TEST DIRECTIONS

Directions: Decide which answer choice is best. If the exact numerical value is not one of the answer choices, select the closest approximation. Fill in the oval on the answer sheet that corresponds to your choice.

Notes:

(1) You will need to use a scientific or graphing calculator to answer some of the questions.
(2) You will have to decide whether to put your calculator in degree or radian mode for some problems.
(3) All figures that accompany problems are plane figures unless otherwise stated. Figures are drawn as accurately as possible to provide useful information for solving the problem, except when it is stated in a particular problem that the figure is not drawn to scale.
(4) Unless otherwise indicated, the domain of a function is the set of all real numbers for which the functional value is also a real number.

Reference Information. The following formulas are provided for your information.

Volume of a right circular cone with radius r and height h: $V = \frac{1}{3}\pi r^2 h$

Lateral area of a right circular cone if the base has circumference c and slant height is l: $S = \frac{1}{2}cl$

Volume of a sphere of radius r: $V = \frac{4}{3}\pi r^3$

Surface area of a sphere of radius r: $S = 4\pi r^2$

Volume of a pyramid of base area B and height h: $V = \frac{1}{3}Bh$

1. A linear function, f, has a slope of -2. $f(1) = 2$ and $f(2) = q$. Find q.

(A) 0
(B) 4
(C) $\frac{3}{2}$
(D) $\frac{5}{2}$
(E) 3

USE THIS SPACE FOR SCRATCH WORK

GO ON TO THE NEXT PAGE

2. A function is said to be even if $f(x) = f(-x)$. Which of the following is *not* an even function?

(A) $y = |x|$
(B) $y = \sec x$
(C) $y = \log x^2$
(D) $y = x^2 + \sin x$
(E) $y = 3x^4 - 2x^2 + 17$

3. What is the radius of a sphere, with center at the origin, that passes through point (2,3,4)?

(A) 3.32
(B) 5.39
(C) 3
(D) 3.31
(E) 5.38

4. If a point (x,y) is in the second quadrant, which of the following must be true?

I. $x < y$
II. $x + y > 0$
III. $\frac{x}{y} < 0$

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

5. If $f(x) = x^2 - ax$, then $f(a) =$

(A) a
(B) $a^2 - a$
(C) 0
(D) 1
(E) $a - 1$

6. The average of your first three test grades is 78. What grade must you get on your fourth and final test to make your average 80?

(A) 80
(B) 82
(C) 84
(D) 86
(E) 88

7. $\log_7 9 =$

(A) 0.89
(B) 0.95
(C) 1.13
(D) 1.21
(E) 7.61

USE THIS SPACE FOR SCRATCH WORK

GO ON TO THE NEXT PAGE

8. If $\log_2 m = x$ and $\log_2 n = y$, then $mn =$
   (A) 2^{x+y}
   (B) 2^{xy}
   (C) 4^{xy}
   (D) 4^{x+y}
   (E) cannot be determined

9. How many integers are there in the solution set of $|x-2| \leq 5$?
   (A) 11
   (B) 0
   (C) an infinite number
   (D) 9
   (E) 7

10. If $f(x) = \sqrt{x^2}$, then $f(x)$ can also be expressed as
   (A) x
   (B) $-x$
   (C) $\pm x$
   (D) $|x|$
   (E) $f(x)$ cannot be determined because x is unknown.

11. The graph of $(x^2-1)y = x^2-4$ has
   (A) one horizontal and one vertical asymptote
   (B) two vertical but no horizontal asymptotes
   (C) one horizontal and two vertical asymptotes
   (D) two horizontal and two vertical asymptotes
   (E) neither a horizontal nor a vertical asymptote

12. $\lim_{x\to\infty}\left(\frac{3x^2+4x-5}{6x^2+3x+1}\right) =$
   (A) $\frac{1}{2}$
   (B) 1
   (C) –5
   (D) $\frac{1}{5}$
   (E) This expression is undefined.

13. A linear function has an x-intercept of $\sqrt{3}$ and a y-intercept of $\sqrt{5}$. The graph of the function has a slope of
   (A) 0.77
   (B) –1.29
   (C) 2.24
   (D) 1.29
   (E) –0.77

14. If $f(x) = \sin x$, then $f^{-1}\left(\frac{\pi}{4}\right) =$
   (A) 52
   (B) 41
   (C) 0.90
   (D) 0.71
   (E) none of the above

USE THIS SPACE FOR SCRATCH WORK

GO ON TO THE NEXT PAGE

15. The plane $2x + 3y - 4z = 5$ intersects the x-axis at $(a,0,0)$, the y-axis at $(0,b,0)$, and the z-axis at $(0,0,c)$. The value of $a + b + c$ is

(A) 5
(B) $\frac{35}{12}$
(C) $\frac{65}{12}$
(D) 1
(E) 9

16. Given the set of data 1, 1, 2, 2, 2, 3, 3, 4, which one of the following statements is true?

(A) mean ≤ median ≤ mode
(B) median ≤ mean ≤ mode
(C) median ≤ mode ≤ mean
(D) mode ≤ mean ≤ median
(E) The relationship cannot be determined because the median cannot be calculated.

17. If $\frac{x-3y}{x} = 7$, what is the value of $\frac{x}{y}$?

(A) $-\frac{8}{3}$
(B) -2
(C) $-\frac{1}{2}$
(D) $\frac{3}{8}$
(E) 2

18. $\frac{\sin 120° \cdot \cos \frac{2\pi}{3}}{\tan 315°} =$

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

19. If $f(x) = \frac{1}{2}x^2 - 8$ is defined when $-4 \le x \le 4$, the maximum value of the graph of $|f(x)|$ is

(A) –8
(B) 0
(C) 8
(D) 4
(E) 2

USE THIS SPACE FOR SCRATCH WORK

GO ON TO THE NEXT PAGE

20. If $\tan\theta = \frac{2}{3}$, then $\sin\theta =$

(A) $\frac{2\sqrt{13}}{13}$

(B) $\pm\frac{2\sqrt{13}}{13}$

(C) $\frac{3\sqrt{13}}{13}$

(D) $\pm\frac{2}{5}$

(E) $\frac{2\sqrt{5}}{5}$

21. If a circle has a central angle of 75° that intercepts an arc of length 75 feet, the number of feet in the radius is

(A) 63.7
(B) 57.3
(C) 44.1
(D) 75.0
(E) 28.6

22. The area of a triangle with sides 3, 5, and 7 is

(A) 7.5
(B) 6.5
(C) 3.75
(D) 13.0
(E) 2.4

23. If $f(x) = i$, where i is an integer such that $i \le x < i + 1$, and $g(x) = f(x) - |f(x)|$, what is the maximum value of $g(x)$?

(A) 0
(B) 1
(C) −1
(D) 2
(E) i

24. If $f(x) = \frac{1}{\sec x}$, then

(A) $f(x) = f(-x)$

(B) $f(\frac{1}{x}) = -f(x)$

(C) $f(-x) = -f(x)$

(D) $f(x) = f(\frac{1}{x})$

(E) $f(x) = \frac{1}{f(x)}$

USE THIS SPACE FOR SCRATCH WORK

GO ON TO THE NEXT PAGE

25. The polar coordinates of a point P are $(2,240°)$. The Cartesian (rectangular) coordinates of P are

(A) $\left(-1,-\sqrt{3}\right)$

(B) $\left(-1,\sqrt{3}\right)$

(C) $\left(-\sqrt{3},-1\right)$

(D) $\left(-\sqrt{3},1\right)$

(E) none of the above

26. The height of a cone is equal to the radius of its base. The radius of a sphere is equal to the radius of the base of the cone. The ratio of the volume of the *cone* to the volume of the *sphere* is

(A) $\frac{1}{3}$

(B) $\frac{1}{4}$

(C) $\frac{1}{12}$

(D) $\frac{1}{1}$

(E) $\frac{4}{3}$

27. In how many different ways can the seven letters in the word MINIMUM be arranged, if all the letters are used each time?

(A) 7
(B) 42
(C) 420
(D) 840
(E) 5040

28. From a deck of 52 different cards, how many different hands, each consisting of three cards, can be drawn?

(A) 132,600
(B) 1.3×10^{67}
(C) 22,100
(D) 1.4×10^{10}
(E) 2652

29. What is the probability of getting at least three heads when flipping four coins?

(A) $\frac{3}{4}$

(B) $\frac{1}{4}$

(C) $\frac{7}{16}$

(D) $\frac{5}{16}$

(E) $\frac{3}{16}$

USE THIS SPACE FOR SCRATCH WORK

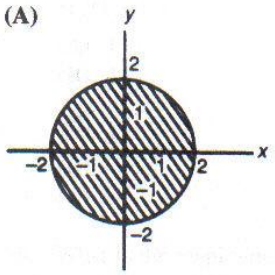
GO ON TO THE NEXT PAGE

30. The positive zero of $y = 3x^2 - 4x - 5$ is, to the nearest tenth, equal to

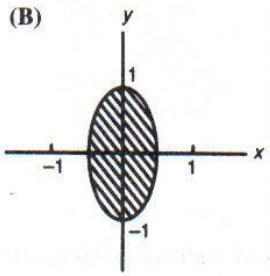
(A) 0.8
(B) $0.7 + 1.1i$
(C) 0.7
(D) 2.1
(E) 2.2

31. In the figure at the right, S is the set of all points in the shaded region. Which of the following represents the set consisting of all points $(2x,y)$, where (x,y) is a point in S?

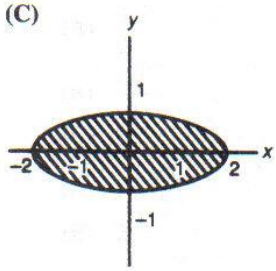
(A)



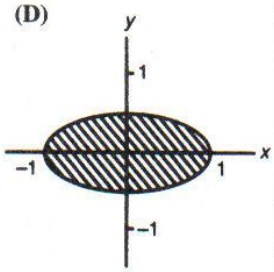
(B)



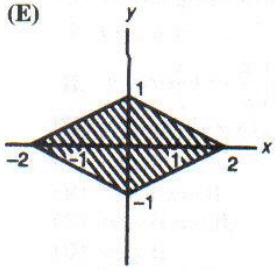
(C)



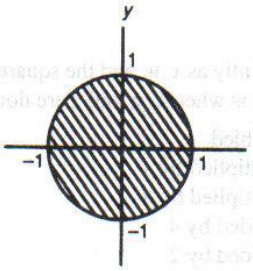
(D)



(E)



USE THIS SPACE FOR SCRATCH WORK



32. If a square prism is inscribed in a right circular cylinder of radius 3 and height 6, the volume inside the cylinder but outside the prism is

(A) 169.6
(B) 3.14
(C) 115.6
(D) 2.14
(E) 61.6

33. If y varies jointly as x, w, and the square of z, what is the effect on w when x, y, and z are doubled?

(A) w is doubled
(B) w is multiplied by 4
(C) w is multiplied by 8
(D) w is divided by 4
(E) w is divided by 2

34. Given the statement "All girls play tennis," which of the following negates this statement?

(A) All boys play tennis.
(B) Some girls play tennis.
(C) All boys do not play tennis.
(D) At least one girl doesn't play tennis.
(E) All girls do not play tennis.

35. $\sum_{j=1}^{5} 2\left(\frac{3}{2}\right)^{j-1} =$

(A) $26\frac{3}{8}$
(B) $26\frac{5}{8}$
(C) $26\frac{1}{2}$
(D) $26\frac{1}{8}$
(E) $26\frac{7}{8}$

36. If $f(x) = \frac{k}{x}$ for all nonzero real numbers, for what value of k does $f(f(x)) = x$?

(A) only 1
(B) only 0
(C) all real numbers
(D) all real numbers except 0
(E) no real numbers

USE THIS SPACE FOR SCRATCH WORK

37. $F(x) = \begin{cases} \dfrac{3x^2 - 3}{x - 1}, & \text{when } x \neq 1 \\ k, & \text{when } x = 1 \end{cases}$

For what value(s) of k is F a continuous function?

(A) 1
(B) 2
(C) 3
(D) 6
(E) no value of k

38. If $f(x,y) = 2x^2 - y^2$ and $g(x) = 2^x$, the value of $g(f(1,2)) =$

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

39. What is the amplitude of the graph of the function $y = \cos^4 x - \sin^4 x$?

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

40. Which of the following could be the equation of one cycle of the graph in the figure on the right?

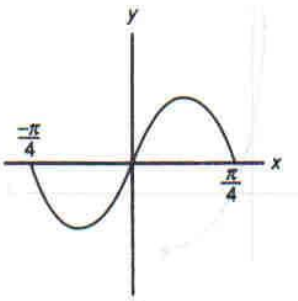
I. $y = \sin 4x$
II. $y = \cos\left(4x - \frac{\pi}{2}\right)$
III. $y = -\sin(4x + \pi)$

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

41. If $2 \cdot \sin^2 x - 3 = 3 \cdot \cos x$ and $90° < x < 270°$, the number of values that satisfy the equation is

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

USE THIS SPACE FOR SCRATCH WORK



42. If $A = \text{Arctan}\left(-\frac{3}{4}\right)$ and $A + B = 315°$, then $B =$

(A) 278.13°
(B) 351.87°
(C) –8.13°
(D) 171.87°
(E) 233.13°

43. The units digit of 1567^{93} is

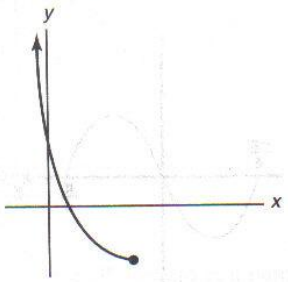
(A) 1
(B) 3
(C) 7
(D) 9
(E) none of the above

44. The vertex angle of an isosceles triangle is 35°. The length of the base is 10 centimeters. How many centimeters are in the perimeter?

(A) 17.4
(B) 44.9
(C) 20.2
(D) 16.6
(E) 43.3

45. If the graph below represents the function $f(x)$, which of the following could represent the equation of the inverse of f?

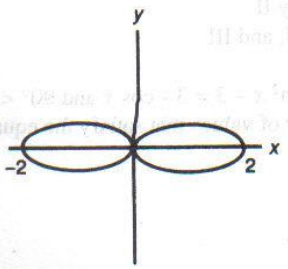
(A) $x = y^2 - 8y - 1$
(B) $x = y^2 + 11$
(C) $x = (y - 4)^2 - 3$
(D) $x = (y + 4)^2 - 3$
(E) $x = (y + 4)^2 + 3$



46. The figure on the right most closely resembles the graph whose equation is

(A) $r = 2 \cdot \cos 2\theta + 2$
(B) $r = 4 \cdot \cos \theta$
(C) $r^2 = 4 \cdot \cos^2 2\theta$
(D) $r^2 = 4 \cdot \cos 2\theta$
(E) $r = \sin \theta + 4$

USE THIS SPACE FOR SCRATCH WORK



GO ON TO THE NEXT PAGE

47. If $f(x) = \log_b x$ and $f(2) = 0.231$, the value of b is

(A) 1.3
(B) 20.1
(C) 0.3
(D) 13.2
(E) 32.5

48. If $f_{n+1} = f_{n-1} + 2 \cdot f_n$ for $n = 2, 3, 4, \ldots$, and $f_1 = 1$ and $f_2 = 1$, then $f_5 =$

(A) 7
(B) 41
(C) 11
(D) 21
(E) 17

49. In a plane, the *homogeneous coordinates* of a point P, whose rectangular coordinates are (x,y), are any three numbers a, b, and c for which $\frac{a}{c} = x$ and $\frac{b}{c} = y$. If the coordinates of P are (3,4) and a, b, and c are integers, then the sum of a, b, and c could be

(A) 2
(B) 5
(C) 8
(D) 11
(E) 14

50. If $[x]$ is defined to represent the greatest integer less than or equal to x, and $f(x) = \left|x - [x] - \frac{1}{2}\right|$, what is the period of $f(x)$?

(A) 1
(B) $\frac{1}{2}$
(C) 2
(D) 4
(E) f is not a periodic function.

USE THIS SPACE FOR SCRATCH WORK