1. The slope of a line perpendicular to the line whose equation is is (A) −3 (B) (C) (D) (E)

2. What is the range of the data set 8, 12, 12, 15, 18? (A) 10 (B) 12 (C) 13 (D) 15 (E) 18

3. If , for what value(s) of x does the graph of y = f(x) have a vertical asymptote? (A) –7 (B) 0 (C) –7,0,7 (D) –7,7 (E) 7

4. If and g(x) = x2 + 1, then f(g(2)) = (A) 2.24 (B) 3.00 (C) 3.61 (D) 6.00 (E) 6.16

5. (A) –0.25 (B) –0.16 (C) 0.16 (D) 6.35 (E) The value is not a real number.

6. The circumference of circle x2 + y2 – 10y – 36 = 0 is (A) 38 (B) 49 (C) 54 (D) 125 (E) 192

7. Twenty-five percent of a group of unrelated students are only children. The students are asked one at a time whether they are only children. What is the probability that the 5th student asked is the first only child? (A) 0.00098 (B) 0.08 (C) 0.24 (D) 0.25 (E) 0.50

8. If f(x) = 2 for all real numbers x, then f(x + 2) = (A) 0 (B) 2 (C) 4 (D) x (E) The value cannot be determined.

9. The volume of the region between two concentric spheres of radii 2 and 5 is (A) 28 (B) 66 (C) 113 (D) 368 (E) 490

10. If a, b, and c are real numbers and if then a could equal (A) (B) (C) 9 (D) 3 (E) 9b6

11. In right triangle ABC, AB = 10, BC = 8, AC = 6. The sine of A is (A) (B) (C) (D) (E)

12. If 16x = 4 and 5x+y = 625, then y = (A) 1 (B) 2 (C) (D) 5 (E)

13. If the parameter is eliminated from the equations x = t2 + 1 and y = 2t , then the relation between x and y is (A) y = x – 1 (B) y = 1 – x (C) y2 = x – 1 (D) y2 = (x – 1)2 (E) y2 = 4x – 4

14. Let f(x) be a polynomial function: f(x) = x5 + · · · . If f(1) = 0 and f(2) = 0, then f(x) is divisible by (A) x – 3 (B) x2 – 2 (C) x2 + 2 (D) x2 – 3x + 2 (E) x2 + 3x + 2

15. If x – y = 2, y – z = 4, and x – y – z = –3, then y = (A) 1 (B) 5 (C) 9 (D) 11 (E) 13

16. If z > 0, a = z cos , and b = z sin , then = (A) 1 (B) z (C) 2z (D) z cos sin (E) z (cos + sin)

17. If the vertices of a triangle are (u,0), (v,8), and (0,0), then the area of the triangle is (A) 4|u | (B) 2|v | (C) |uv | (D) 2|uv | (E) |uv |

18. If what must the value of k be in order for f(x) to be a continuous function? (A) –2 (B) 0 (C) 2 (D) 5 (E) No value of k will make f(x) a continuous function.

19. What is the probability that a prime number is less than 7, given that it is less than 13? (A) (B) (C) (D) (E)

20. The ellipse 4x2 + 8y2 = 64 and the circle x2 + y2 = 9 intersect at points where the y -coordinate is (A) ± (B) ± (C) ± (D) ± (E) ± 10.00

21. Each term of a sequence, after the first, is inversely proportional to the term preceding it. If the first two terms are 2 and 6, what is the twelfth term? (A) 2 (B) 6 (C) 46 (D) 2 · 311 (E) The twelfth term cannot be determined.

22. A company offers you the use of its computer for a fee. Plan A costs $6 to join and then $9 per hour to use the computer. Plan B costs $25 to join and then $2.25 per hour to use the computer. After how many minutes of use would the cost of plan A be the same as the cost of plan B? (A) 18,052 (B) 173 (C) 169 (D) 165 (E) 157

23. If the probability that the Giants will win the NFC championship is p and if the probability that the Raiders will win the AFC championship is q , what is the probability that only one of these teams will win its respective championship? (A) pq (B) p + q –2pq (C) |p – q| (D) 1 – pq (E) 2pq – p – q

24. If a geometric sequence begins with the terms , 1, · · · , what is the sum of the first 10 terms? (A) (B) 6561 (C) (D) (E) 6

25. The value of is (A) greater than (B) between and (C) between and (D) between 10 and (E) less than 10

26. If A is the angle formed by the line 2y = 3x + 7 and the x -axis, then A equals (A) –45° (B) 0° (C) 56° (D) 72° (E) 215°

27. A U.S. dollar equals 0.716 European euros, and a Japanese yen equals 0.00776 European euros. How many U.S. dollars equal a Japanese yen? (A) 0.0056 (B) 0.011 (C) 0.71 (D) 94.2 (E) 179.98

28. If (x – 4)2 + 4(y – 3)2 = 16 is graphed, the sum of the distances from any fixed point on the curve to the two foci is (A) 4 (B) 8 (C) 12 (D) 16 (E) 32

29. In the equation x2 + kx + 54 = 0, one root is twice the other root. The value(s) of k is (are) (A) –5.2 (B) 15.6 (C) 22.0 (D) ± 5.2 (E) ± 15.6

30. The remainder obtained when 3x4 + 7x3 + 8x2 – 2x – 3 is divided by x + 1 is (A) –3 (B) 0 (C) 3 (D) 5 (E) 13

31. If and , what does equal? (A) 5.1 (B) 7.4 (C) 7.5 (D) 8.1 (E) 8.3

32. If = 3 and , then = (A) 2.65 (B) 2.58 (C) 2.56 (D) 2.55 (E) 2.54

33. For what values of k does the graph of pass through the origin? (A) only 0 (B) only 1 (C) ±1 (D) ± (E) no value

34. If (A) 15° (B) 30° (C) 45° (D) 60° (E) 75°

35. If < 0 and f(x) = , then (A) 0 < f(x) < 6 (B) (C) f(x) > 12 (D) f(x) > 0 (E) 6 < f(x) < 12

36. If f(x) = |x | + [x ], the value of f(–2.5) + f(1.5) is (A) −2 (B) 1 (C) 1.5 (D) 2 (E) 3

37. If (sec x)(tan x) < 0, which of the following must be true? I. tan x < 0 II. csc x cot x < 0 III. x is in the third or fourth quadrant (A) I only (B) II only (C) III only (D) II and III (E) I and II

38. At the end of a meeting all participants shook hands with each other. Twenty-eight handshakes were exchanged. How many people were at the meeting? (A) 7 (B) 8 (C) 14 (D) 28 (E) 56

39. Suppose the graph of f(x) = 2x2 is translated 3 units down and 2 units right. If the resulting graph represents the graph of g(x ), what is the value of g (– 1.2)? (A) –1.72 (B) –0.12 (C) 2.88 (D) 17.48 (E) 37.28

40. Four points on the graph of a polynomial P are shown in the table  . If P is a polynomial of degree 3, then P(x) could equal (A) (x – 5)(x – 2)(x + 1) (B) (x – 5)(x + 2)(x + 1) (C) (x + 5)(x – 2)(x – 1) (D) (x + 5)(x + 2)(x – 1) (E) (x + 5)(x + 2)(x + 1)

41. If f(x) = ax + b, which of the following make(s) f(x) = (x )? I. a = –1, b = any real number II. a = 1, b = 0 III. a = any real number, b = 0 (A) only I (B) only II (C) only III (D) only I and II (E) only I and III

42. In the figure , A = 110°, a = and b = 2. What is the value of C ? (A) 50° (B) 25° (C) 20° (D) 15° (E) 10°

43. If vector and vector = (3,–2), find the value of (A) 5.4 (B) 6 (C) 7 (D) 7.2 (E) 52

44. If and , then g(f(3)) = (A) 0.2 (B) 1.7 (C) 2.1 (D) 3.5 (E) 8.7

45. In ABC , a = 2x, b = 3x + 2, , and C = 60°. Find x. (A) 0.50 (B) 0.64 (C) 0.77 (D) 1.64 (E) 1.78

46. If and , then (A) (B) (C) (D) (E)

47. If f(x) = 3x2 + 4x + 5, what must the value of k equal so that the graph of f(x – k) will be symmetric to the y-axis? (A) – 4 (B) (C) (D) (E)

48. If f(x) = cos x and g(x) = 2x + 1, which of the following are even functions? I. f(x) · g(x ) II. f(g(x )) III. g(f(x )) (A) only I (B) only II (C) only III (D) only I and II (E) only II and III

49. A cylinder whose base radius is 3 is inscribed in a sphere of radius 5. What is the difference between the volume of the sphere and the volume of the cylinder? (A) 88 (B) 297 (C) 354 (D) 448 (E) 1345

50. Under which conditions is negative? (A) 0 < y < x (B) x < y < 0 (C) x < 0 < y (D) y < x < 0 (E) none of the above