1. (C) Solve for y. Slope Slope of perpendicular

2. (A) Range = largest value – smallest value = 18 – 8 = 10. [4.1]

3. (A) Vertical asymptotes occur where the denominator is zero but the numerator is not. The denominator, x2 – 49, factors into (x + 7)(x – 7). Since both numerator and denominator are zero when x = 7, a vertical asymptote occurs only at x = –7. [1.2]

4. \* (C) Enter the function f into Y1 and the function g into Y2. Evaluate Y1(Y2(2)) to get the correct answer choice C. An alternative solution is to evaluate g(2) = 5 and f(5) = , and either use your calculator to evaluate or observe that 3 < < 4, indicating 3.61 as the only feasible answer choice. [1.1]

5. \* (C) Enter the expression into your graphing calculator. [1.4]

6. \* (B) Complete the square to get x2 + (y – 5)2 = 61. Radius

7. \* (B) Whether or not students in the group have siblings are independent events. The probability that each of the first four is not an only child is (0.75)4. The probability that the fifth student is an only child is 0.25, so the probability of seeing the first four children with siblings and the fifth an only child is (0.75)4(0.25) ≈ 0.08 [4.2]

8. (B) Regardless of what is substituted for x, f(x) still equals 2 Alternative Solution: f(x + 2) causes the graph of f(x) to be shifted 2 units to the left. Since f(x) = 2 for all x, f(x + 2) will also equal 2 for all x. [1.1]

9. \* (E) Enter the formula for the volume of a sphere (in the reference list of formulas) into Y1. Return to the Home Screen, and enter Y1(5) – Y1(2) to get the correct answer choice E. An alternative solution is to evaluate directly. [2.2]

10. \* (D) Since , divide out b3c8, leaving a5 = 9a3. Therefore a = ±3. [1.4]

11. (C) sin

12. (C) Since the power is the square root, x = because the square root of 16 is 4. Since 54 = 625, x + y = 4, so that

13. (E) . Eliminate the parameter and get or y2 = 4x – 4. [1.6]

14. (D) f(1) = 0 and f(2) = 0 imply that x – 1 and x – 2 are factors of f(x). Their product, x2 – 3x + 2, is also a factor. [1.2]

15. (C) Add the first two equations to get x – z = 6. Substitute this in the third equation to get 6 – y = –3, and solve for y. [algebra]

16. (B) a2 = z2 cos2 and b2 = z2 sin2 , so a2 + b2 = z2(cos2 + sin2 ) = z2 because cos2 + sin2 = 1. Since when z > 0, the correct answer choice is B. [1.3]

17. (A) Sketch a graph of the three vertices. The base is |u | and the altitude is 8. Therefore, the area is 4 |u |. [2.1]

18. \* (E) Plot the graph of in the standard window, and observe the asymptote at x = 2. This says that no value of k can make f(x) continuous at x = 2.An alternative solution is to observe that x = 2 makes the denominator of f(x) equal to zero, thereby implying that x = 2 is a vertical asymptote. Thus, f(x) cannot be made continuous at the point with that x value. [1.6]

19. (D) There are 5 prime numbers less than 13: 2, 3, 5, 7, 11. Three of these are less than 7, so the correct probability is .

20. \* (D) Substituting for x2 and solving for y gives 4(9 – y2) + 8y2 = 64. 4y2 = 28, and so y2 = 7 and

21. (B) tn · tn + 1 = K. 2 · 6 = K = 12. Therefore, 6 · t3 = 12, and so t3 = 2. Continuing this process gives all odd terms to be 2 and all even terms to be 6. [3.4]

22. \* (C) Graph the cost of Company A y = 6 + 9x and the cost of Company B y = 25 + 2.25x in a window xε[0,10] and yε[0,50]. Use CALC/intersect to find the x-coordinate of the point of intersection at 2.8148 hours, the “breakeven” point. Multiply by 60 to convert this time to the correct answer choice.An alternative solution is to solve the equation 6 + 9x = 25 + 2.25x and multiply the solution by 60 to get the answer of about 169 minutes. [1.2]

23. (B) The probability that both teams will win is pq. The probability that both will lose is (1 – p)(1 – q). The probability that only one will win is 1 – [pq + (1 – p)(1 – q )] = 1 – (pq + 1 – p – q + pq) = p + q – 2pq.Alternative Solution: The probability that the Giants will win and the Raiders will lose is p (1 – q). The probability that the Raiders will win and the Giants will lose is q (1 – p ). Therefore, the probability that either one of these results will occur is p (1 – q) + q (1 – p) = p + q – 2pq. [4.2]

24. \* (A) Calculate the common ratio as . The first term is so the nth term is . Use the sum and sequence features of your calculator to evaluate the sum of the first 10 terms in the generated sequence: The range is 0 to 9 instead of 1 to 10 because the formula for tn uses the exponent n – 1. An alternative solution is to use the formula for the sum of a geometric series:

25. \* (C) No calculator currently on the market can compute 453!, so doing this problem requires some knowledge of factorial arithmetic. The easiest solution to the problem is to observe that is the number of combinations of 453 taken 3 at a time (453C3). Enter 453MATH/PRB/nCr3 into your calculator to find that the correct answer choice is C.An alternative solution is to simplify

26. \* (C) Solve for y: . Slope . Tan A also equals . Therefore, ≈ 56°. [1.3]

27. \* (B) 1 yen equals 0.0076 euros, and 1 euro equals dollars. Therefore, 1 yen equals 0.0076 × 1.40 = 0.011 dollars. [algebra]

28. (B) Divide the equation through by 16 to get . This is the equation of an ellipse with a2 = 16. The sum of the distances to the foci = 2a = 8. [2.1]

29. \* (E) If the roots are r and 2r, their sum and their product . Therefore, and . Alternative Solution: If the roots are r and 2r, (x – r )(x – 2r) = 0. Multiply to obtain x2 – 3r + 2r2 = 0, which represents x2 + kx + 54 = 0. Thus, –3r = k and 2r2 = 54. Since , then and

30. (C) Substituting –1 for x gives 3.Alternative Solution: Use synthetic division to get

31. \* (D) The inverse of f(x) = ex is f–1(x) = ln x. g(2) = e2 + ln 2 8.1. [1.4]

32. \* (C) This is a recursively defined sequence. Press 3 ENTER on your calculator. Then enter and press ENTER 3 times to get x3 2.56. [3.4]

33. (C) If the graph passes through the origin, x = 0 and y = 0, then . k2 = 1, and so k = ±1. [2.1]

34. \* (D) Graph using Ztrig in degree mode. Find the point of intersection with CALC/intersect to arrive at the correct answer choice D. An alternative solution uses the identities tan and tan 30º = to deduce , so = 60º. [1.3]

35. \* (E) The problem is asking for the range of f(x) values for values of x that satisfy the inequality. First graph the inequality in Y1, starting with the standard window and zooming in until the x values for the portion of the graph that falls below the x-axis can be identified as the interval (–2,–1). Then enter the formula for f(x) in Y2. Although it can be done graphically, the simplest way to find the range of values of f(x) that correspond to xε(–2,– 1) is to use the TABLE function. Deselect Y1 and enter TBLSET and set TblStart to –2, Tbl = 0.1, and Indpnt and Depend to Auto. Then enter TABLE and observe that the Y2 values range from 12 to 6 as x ranges from – 2 to –1, yielding the correct answer choice D.An alternative solution is to solve the inequality algebraically by solving the associated equation x2 + 3x + 2 = 0 and testing points. The left side of the equation factors as (x + 2)(x + 1), and the Zero Product Property implies that x = –2 or x = –1. Points inside the interval (–2,–1) satisfy the inequality, while those outside it do not. Since the graph of f(x) is a parabola and f(–2) = 12 and f(–1) = 6, f(x) takes the range of values between 12 and 6. [1.2]

36. \* (D) Recall that the notation [x] means the greatest integer less than or equal to x. Enter abs(x) + int(x) into Y1. Return to the Home Screen, and enter Y1(–2.5) + Y1(1.5) to get the correct answer choice D.An alternative solution evaluates |–2.5| + [–2.5] + |1.5| + [1.5] without the aid of a calculator. Of these 4 values, only [–2.5] is tricky since [–2.5] = –3, not –2. Thus, |–2.5| + [–2.5] + |1.5| + [1.5] = 2.5 – 3 + 1.5 + 1 = 2. [1.6]

37. (C) Set up the following table.Q1Q2Q3Q4 sec x+ – – + tan x + – + – cot x + – + – csc x+ + – – The product secx tanx is negative only when its factors have different signs, so III is the only true statement. [1.3]

38. (B)

39. \* (D) Since the function g is f translated 3 down and 2 right, g(x) = f(x – 2) – 3. Therefore, g(–1.2) = f(–3.2) – 3 = 2(–3.2)2 – 3 = 17.48. [2.1]

40. (D) Since –5 and 1 are both zeros, (x + 5) and (x – 1) are factors of P(x ). Since P(x) changes sign between x = –3 and x = –1, there is a zero between these two values. Choice D is the only one that meets all three criteria. [1.2]

41. \* (D) The graph of f must be symmetric about the line y = x. In other words, interchanging x and y must leave the graph unchanged. In I, x = –y + b, which is equivalent to y = –x + b, which is symmetric about y = x. In II, x = y. In III, x = ay, or

42. \* (C) Law of sines:

43. \* (D)

44. \* (C)

45. \* (B) Law of Cosines: Use program QUADFORM to get x = ±0.64. Since a side of a triangle must be positive, x can equal only 0.64. [1.3]

46. (D)

47. \* (D) Graph y = 3x2 + 4x + 5 in the standard window, and observe that the graph must be moved slightly to the right to be symmetric to the y-axis. Therefore, k must be positive. Use CALC/minimum to find the vertex of the parabola and observe that its x-coordinate is –0.66666. . . . If the function entered into and graph Y2 to verify this answer. [2.1]

48. \* (C) Use ZTrig to plot the graphs of y = (cos x) · (2x + 1), y = cos(2x + 1), and y = 2(cos x) + 1 to see that only the third graph is symmetric about the yaxis and thus represents an even function.An alternative solution is to use your knowledge of transformations. Although f is an even function, g is not; therefore, (I) f · g is not even. Also, f(g(x )) = cos(2x + 1), which is a cosine curve shifted less than to the left. Thus, f(g(x )) (II) is not even. However, g(f(x )) = 2 cos x + 1 is a cosine curve with period 2 , amplitude 2, shifted 1 unit up. Thus, g(f(x )) (III) is even. [1.1]

49. \* (B) Height of cylinder is 8. Volume of sphere Volume of cylinder Difference

50. \* (B) In answer choice B, x and y have the same sign, and x is less than y. Therefore, xy is positive, x – y is negative, and the quotient is negative. The numerators and denominators in answer choices A, C, and D both have the same sign, so the quotients are positive. [algebra]