

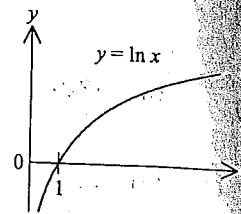
PAST EXAMINATION QUESTIONS

1. If the quadratic equations $3x^2 + px + 1 = 0$ and $2x^2 + qx + 1 = 0$ have a common root show that $2p^2 + 3q^2 - 5pq + 1 = 0$. (J61/P1/6ii)
2. (i) Solve the equation $x^2 - 2\sqrt{3}x - 1 = 0$, giving your answers in their simplest surd form.
(ii) The sum of a number and its reciprocal is 4. Find the number and express it in the simplest surd form. (N62/P1B/1i-ii)
3. By using the substitution $u = 3^x$, or otherwise, solve the equation $3^{2x+1} + 3^2 = 3^{x+3} + 3^x$. (N64/P1/5i)
4. By means of the substitution $y = 2^x$, solve the equation $2^{2x-1} - 9 \cdot 2^{x-2} + 1 = 0$. (N65/P1/7ii)
5. By substituting $y = 2^x$, or otherwise, solve the equation $2^{2x} + 2^{x+2} - 4 \cdot 2^3 = 0$. (N68/P1/7ii)
6. Solve the equation $\sqrt{x+4} + \sqrt{x+10} = \sqrt{8x+18}$. (J70/P1/5ii)
7. Solve the equation $2^{2x+3} + 2^{x+3} = 1 + 2^x$. (N71/P1/5ii)
8. Using the substitution $u = 2^z$, or otherwise, solve the equation $2^{2z} - 3 \cdot 2^{z+\frac{1}{2}} + 2^z = 0$. (J72/P1/5ii)
9. Find the dimensions of the rectangle whose perimeter is of length 8 m and which is such that the sum of the areas of the squares on all four sides is 17 m^2 . (sp1/6)
10. By using an appropriate substitution, or otherwise, solve the equation $3^{2t+1} + 3^{t+2} = 3^{\frac{1}{3}}$. (N73/P1/5ii)
11. Given that $\log_2 3 = 1.585$, calculate, without using tables or a calculator, the value of x for which $2^{2x-1} = 2^{x-1} + 3$. (J76/P2/11ii)
12. Evaluate x if $\log_2(1+x) + \log_2(5-x) - \log_2(x-2) = 3$. (N76/P2/13b)
13. Solve the equations (a) $1 + \sqrt{x+3} = \sqrt{2x-1}$. (b) $\log_2 y^2 = 3 + \log_2(y+6)$. (N77/P1/11)
14. Find the dimensions of the rectangle whose perimeter is 36 m and which is such that the square of the length of the diagonal is 170 m^2 . (J78/P1/5)
15. Solve the equation $\lg y + \lg(2y-1) = 0$. (N78/P2/11b)
16. By using the substitution $y = 8^x$, or otherwise, solve the equation $64^x - 8^{x+1} + 16 = 0$. (J79/P2/16b)
17. (a) Solve the equation $\sqrt{4x-9} = 2\sqrt{x} - 1$. (b) Solve the equation $7^{x^2} - 49^{6-2x} = 0$. (N80/P2/11a-b)
18. Solve the equation $\frac{6}{\sqrt{x-1}} - 2\sqrt{x-1} = 1$. (J81/P1/11a)
19. Find the values of y which satisfy the equation $(8^y)^y \cdot \frac{1}{32^y} = 4$. (J82/P1/11b)
20. Solve the equation $3x - \sqrt{9x^2 - 20} = 4$. (N82/P2/11c)
21. Find the value of x which satisfies the equation $\sqrt{3x-5} - \sqrt{x+2} = \sqrt{x-6}$. (N83/P1/11b)
22. Without using tables or a calculator, solve the equation $3^{y^2+3} = 9^{2y}$. (J84/P2/11ii)
23. Solve the equation $z + \sqrt{32-z} = 2$. (N84/P1/11iii)
24. Solve the equations (i) $y = \sqrt{y+9} + 3$. (ii) $2 \lg z = \lg(3z+4)$. (J85/P2/11ii-iii)
25. Solve the equation $\log_2 y^2 = 4 + \log_2(y+5)$. (N85/P1/11aii)
26. By using the substitution $y = e^x$, find the value of x such that $e^{2x} = e^x + 12$. (J86/P2/5a)
27. Solve the equation $\log_2 x + \log_2(6x+1) = 1$. (J87/P2/5b)
28. Solve the equation $\lg(x^2 + 12x - 3) = 1 + 2 \lg x$. (N87/P2/5b)
29. Solve the equation $\lg(x^2 - 2x + 8) = 2 \lg x$. (J88/P2/4ai)
30. (a) Solve the equation $\lg x + \lg(3x+1) = 1$. (b) By using the substitution $y = e^x$, find the value of x such that $8e^{-x} - e^x = 2$. (N88/P2/5b)
31. By using the substitution $u = 2^x$, solve the equation $4^x - 9(2^x) + 8 = 0$. (J89/P2/5c)
32. By using the substitution $y = e^{2x}$, solve the equation $e^{2x} + 4e^{-2x} = 4$. (J90/P2/5b)
33. Solve $\log_3(4x) + \log_3(x-1) = 1$. (N90/P2/5aii)
34. (a) Solve the equation $2 \lg x + \lg 4 = \lg(9x-2)$. (b) By means of the substitution $3^x = y$, solve the equation $3^{2x} - 3^{x+2} + 8 = 0$, giving answers to two decimal places where necessary. (J91/P2/5a, b)

35. Solve the equation $1 + 2 \lg x = \lg(11x - 3)$. (N92/P2/7a)
36. Solve the equation $\lg(2x) - 3 \lg 2 = \frac{1}{2} \lg(x - 3)$. (J93/P2/4b)
37. (a) Solve the equation $2 \lg(x + 2) + \lg 4 = \lg x + 4 \lg 3$. (b) Solve the equation $2^{2x} - 2^{x+3} + 7 = 0$. (N95/P2/6a, b)
38. Given that $x = \lg a$ is a solution of the equation $10^{2x+1} - 7(10^x) = 26$, find the value of a . (N97/P2/4c)
39. Find the value of x which satisfies the equation $e^{2x} - e^x - 6 = 0$. (J98/P2/5c)
40. Solve the equation $9^{2x} + 2(9^{x+1}) = 40$. (N99/P2/3b)
41. Solve the equation $3^{2x} - 3^{x+1} - 10 = 0$. (J2000/P2/4b)
42. Two flower beds, each of which is square, have a combined area of 18.5 m^2 . The sum of the perimeters of the two flower beds is 24 m . Determine the length of the side of each flower bed. (sp1/7)
43. Solve the equations
 (i) $2 \lg x = 1 + \lg\left(\frac{4x-15}{2}\right)$,
 (ii) $4^y - 7(2^y) = 8$. (J2001/P2/3b)
44. Solve the equation $\log_3 y + 4 \log_y 3 = 4$. (J2002/P2/10(b))
45. (i) Sketch the graph of $y = \ln x$.
 (ii) Determine the equation of the straight line which would need to be drawn on the graph of $y = \ln x$ in order to obtain a graphical solution of the equation $x^2 e^{x-2} = 1$. (N2002/P2/8)

TOPIC 6 SOLUTION OF QUADRATIC EQUATIONS

2. (i) $\sqrt{3} \pm 2$
 (ii) $2 \pm \sqrt{3}$
3. $x = -1$ or 2
4. $2, -1$
5. $x = 2$
6. $x = 2\frac{1}{4}$
7. $x = -3$
8. $z = \frac{1}{2}$ or $\frac{3}{2}$
9. $2.5 \text{ m}, 1.5 \text{ m}$
10. $t = -1$
11. 1.585
12. 3
13. (a) 13
 (b) $12, -4$
14. $7 \text{ m}, 11 \text{ m}$
15. $2\frac{1}{2}$
16. $\frac{2}{3}$
17. (a) $6\frac{1}{4}$
 (b) 2 or -6
18. $3\frac{1}{4}$
19. $-\frac{1}{3}, 2$
20. $1\frac{1}{2}$
21. 7
22. $1, 3$
23. -4
24. (i) $y = 7$
 (ii) $z = 4$
25. -4 or 20
26. 1.39
27. $\frac{1}{2}$
28. $\frac{1}{3}, 1$
29. 4
30. (a) $1\frac{2}{3}$
 (b) 0.693
31. $0, 3$
32. 0.347
33. $1\frac{1}{2}$
34. (a) $\frac{1}{4}, 2$
 (b) $0, 1.89$ $y = \ln x$
35. $\frac{1}{2}, \frac{3}{5}$
36. $4, 12$
37. (a) $\frac{1}{4}, 16$
 (b) $0, 2.81$
38. $a = 2$
39. $x = 1.10$
40. 0.315
41. $x = 1.46$
42. The lengths are 2.5 m and 3.5 m
43. (i) $x = 5$ or 15
 (ii) $y = 3$
44. $y = 9$
45. (i)



(ii) $y = \frac{2-x}{2}$