

# ALGEBRA REVISION QUESTIONS

These 3 part questions are similar to the questions on the LC paper. The answers to these questions and hints to help you solve them are available on our website:

**[www.studentxpress.ie](http://www.studentxpress.ie)**

- (a) Solve  $\log_9 (x + 2) - \log_3 x = 0$ .

(b) Show that  $x^2 + ax + b = 0$  and  $x^2 + bx + a = 0$  have a common root of 1 if  $a + b = -1$ .

(c) Solve (i)  $\sqrt{x-5} + 2 = \sqrt{x+7}$ , (ii)  $2^{2x+1} - 16 \cdot 2^x + 32 = 0$ .
- (a) If  $\frac{ax}{b-c} = \frac{by}{c-a} = \frac{cz}{a-b}$  show  $ax + by + cz = 0$ .

(b) Solve (i)  $x + \sqrt{5x+19} = -1$ , (ii)  $\log_2 x + \frac{12}{\log_2 x} = 7$ .

(c) If  $\alpha, n\alpha$  are the roots of  $ax^2 + bx + c = 0$  show  $nb^2 = (1+n)^2 ac$ .
- (a) Solve  $(1 - \frac{1}{x})^2 = 2$ . Give your answer in the form  $a + \sqrt{b}$ .

(b) Solve  $x^3 + 3x^2 + x - 2 = 0$  given one integer root.

(c) If  $F(\frac{a}{b}) = F(a) - F(b)$  for all positive values of  $a$  and  $b$ , show

(i)  $F(1) = 0$ , (ii)  $F(\frac{1}{x}) = -F(x)$ , (iii)  $F(y^2) = 2F(y)$ .
- (a) Solve  $\log_4 (6x + 1) - 2 = 2 \log_4 x$ .

(b) One root of  $x^3 + kx + 4 = 0$  is 2.

(i) Find  $k$ , (ii) find the other roots.

(c) Find  $k$  if the curves  $C_1: y = (1 - k) - x - x^2$  and  $C_2: y = x^2 + 2kx + \frac{3}{2}$  intersect at one point only.
- (a) If  $f(x) = \frac{1}{x^n}$  and  $f(x) = f(\frac{1}{x})$  show  $n = 0$ .

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(b) If  $\alpha, \beta$  are roots of a quadratic  $(k + 2)x^2 + (2k + 1)x + k = 0$  find  $k$  if  $\alpha = \beta$ .

(c) Prove  $(ax + by)^2 \leq (a^2 + b^2)(x^2 + y^2)$  for all  $a, b, x, y \in R$ .

6. (a) (i) If  $27^x = 9$  and  $2^{x-y} = 64$  find  $x, y$ .

(ii) If  $f(x) = \frac{2^x}{2^{2x} + 1}$ , find  $f(-1)$ .

(b) If  $\alpha, \beta$  are the roots of  $f(x) = x^2 + 2kx + k + 2 = 0$  show that  $(\alpha - \beta)^2 = 4(k^2 - k - 2)$ . If the roots differ by 4, find the values of  $k$ .

(c) If  $\alpha, \beta$  are roots of  $x^2 + 2bx + c = 0$  show that  $\alpha^3 + \beta^3 = 2b(3c - 4b^2)$ .

7. (a) If  $(x + 1)$  and  $(x - 3)$  are factors of  $f(x) = kx^3 - 6x^2 + bx - 6$ , find  $k$  and  $b$  and the other root.

(b) (i) Solve  $\frac{x}{x+1} > 2$ , (ii) Solve  $\left| \frac{2+x}{x-3} \right| > 4$ .

(c) If the roots of the equation  $px^2 + qx + r$  are in the ratio 5:3, show that  $15q^2 = 64pr$ .

8. (a) Solve  $\left| \frac{7x-3}{2x+1} \right| = 4$ .

(b) Find the co-ordinates of the points of intersection of the curves:  
 $y = 2x^2 - 7x - 17 = 0$   
 $y = 2x^2 + 9x - 13 = 0$

(c) If  $x, y \in R$  and  $x + y = 1$  show that  $4xy \leq 1$ . Deduce that  $x^2 + y^2 \geq \frac{1}{2}$ .

9. (a) Solve  $4x^{-1} - 9x^{-\frac{1}{2}} + 2 = 0$ .