

ALGEBRA (Q 1 & 2, PAPER 1)

2005

1 (a) Solve the simultaneous equations:

$$\frac{x}{5} - \frac{y}{4} = 0$$

$$3x + \frac{y}{2} = 17$$

(b) (i) Express $2^{\frac{1}{4}} + 2^{\frac{1}{4}} + 2^{\frac{1}{4}} + 2^{\frac{1}{4}}$ in the form $2^{\frac{p}{q}}$, where $p, q \in \mathbf{Z}$.

(ii) Let $f(x) = ax^3 + bx^2 + cx + d$. Show that $(x-t)$ is a factor of $f(x) - f(t)$.

(c) $(x-p)^2$ is a factor of $x^3 + qx + r$. Show that $27r^2 + 4q^3 = 0$. Express the roots of $3x^2 + q = 0$ in terms of p .

2 (a) Solve for x : $|x-1| = 7$, where $x \in \mathbf{R}$.

(b) The cubic equation $4x^3 + 10x^2 - 7x - 3 = 0$ has one integer root and two irrational roots. Express the irrational roots in simplest surd form.

(c) Let $f(x) = \frac{x^2 + k^2}{mx}$, where k and m are constants and $m \neq 0$.

(i) Show that $f(km) = f\left(\frac{k}{m}\right)$.

(ii) a and b are real numbers such that $a \neq 0$, $b \neq 0$ and $a \neq b$. Show that if $f(a) = f(b)$, then $ab = k^2$.

ANSWERS

1 (a) $x = 5, y = 4$

1 (b) (i) $2^{\frac{9}{4}}$

1 (c) $x = \pm p$

2 (a) $-6 < x < 8$

2 (b) $\frac{1 \pm \sqrt{5}}{4}$