

ALGEBRA (Q 1 & 2, PAPER 1)

2009

1 (a) Find the value of $\frac{x}{y}$ when $\frac{2x+3y}{x+6y} = \frac{4}{5}$.

(b) Let $f(x) = x^2 - 7x + 12$.

(i) Show that if $f(x+1) \neq 0$, then $\frac{f(x)}{f(x+1)}$ simplifies to $\frac{x-4}{x-2}$.

(ii) Find the range of values of x for which $\frac{f(x)}{f(x+1)} > 3$.

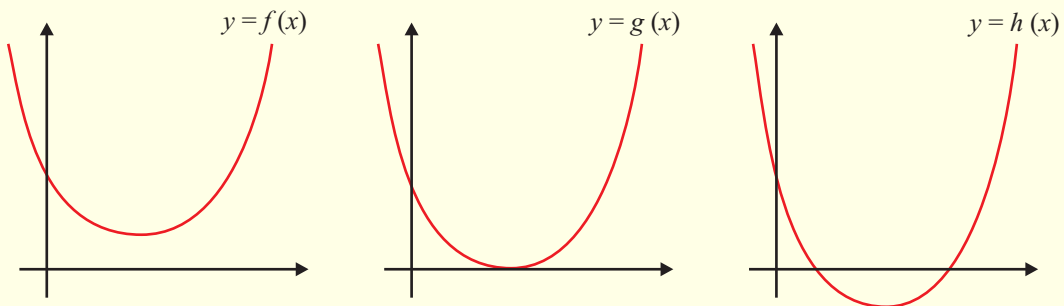
(c) Given that $x - c + 1$ is a factor of $x^2 - 5x + 5cx - 6b^2$, express c in terms of b .

2. (a) Solve the simultaneous equations

$$x - y + 8 = 0$$

$$x^2 + xy + 8 = 0.$$

(b) (i) The graphs of three quadratic functions, f , g and h , are shown.



In each case, state the nature of the roots of the function.

(ii) The equation $kx^2 + (1-k)x + k = 0$ has equal real roots.
Find the possible values of k .

(c) (i) One of the roots of $px^2 + qx + r = 0$ is n times the other root.
Express r in terms of p , q and n .

(ii) One of the roots of $x^2 + qx + r = 0$ is five times the other.
If q and r are positive integers, determine the set of possible values of q .

ANSWERS

1 (a) $\frac{3}{2}$

(b) (ii) $1 < x < 2$

(c) $c = 1 + b, c = 1 - b$

2 (a) $x = -2, y = 6$

(b) (i) $y = f(x)$: No real roots

$y = g(x)$: Two equal real roots

$y = h(x)$: Two different real roots

(ii) $k = -1, \frac{1}{3}$

(c) (i) $r = \frac{nq^2}{p(n+1)^2}$ (ii) $q = \{6, 30, 150, \dots, 6 \times 5^{\frac{n-1}{2}}\}, n \text{ odd.}$