C1 Discriminant Past Paper Questions

Jan 2008 Q8

The Equation $x^2 + kx + 8 = k$, has no real solutions for x.

a. Show that k satisfies $k^2 + 4k - 32 < 0$ [3]
b. Hence find the set of possible values of k. [4]

May 2007 Q7

The equation $x^2 + kx + (k + 3) = 0$, where k is a constant, has different real roots

a. Show that $k^2 - 4k - 12 > 0$ [2]
b. Find the set of possible values of k. [4]

Jan 2007 Q5

The equation $2x^2 - 3x - (k + 1) = 0$, where k is constant, has no real roots.
Find the set of possible values of k. [4]

May 2006 Q8

The equation $x^2 + 2px + (3p + 4) = 0$, where p is a positive constant, has equal roots.

(a) Find the value of p. [4]
(b) For this value of p, solve the equation $x^2 + 2px + (3p + 4) = 0$. [2]

Jan 2006 Q10

$$x^2 + 2x + 3 \equiv (x + a)^2 + b.$$

(a) Find the values of the constants a and b.

(2)

(b) Sketch the graph of $y = x^2 + 2x + 3$, indicating clearly the coordinates of any intersections with the coordinate axes.

(3)

(c) Find the value of the discriminant of $x^2 + 2x + 3$. Explain how the sign of the discriminant relates to your sketch in part (b).

(2)

The equation $x^2 + kx + 3 = 0$, where k is a constant, has no real roots.

(d) Find the set of possible values of k, giving your answer in surd form.

(4)

C1 - Discriminant Past Paper Questions

Jan 08

Q8 (a) $x^2 + kx + 8 = k$

$x^2 + kx + (8-k) = 0$

If no real solutions then $b^2 - 4ac < 0$

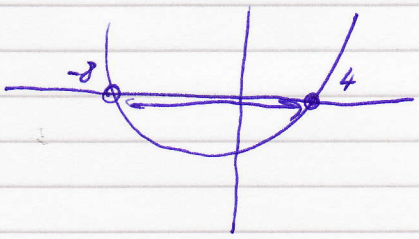
$k^2 - 4 \times 1 \times (8-k) < 0$

$k^2 - 32 + 4k < 0$

$k^2 + 4k - 32 < 0$ As required

(b) $(k+8)(k-4) < 0$

$k = -8$ or $k = 4$



$\therefore \quad -8 < k < 4$

May 2007

Q7 $x^2 + kx + (k+3) = 0$

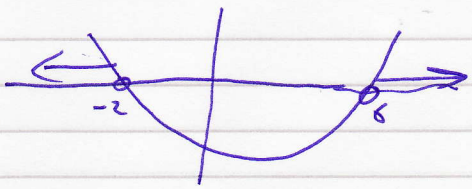
(a) For different, real roots, discriminant > 0

$k^2 - 4 \times 1 \times (k+3) > 0$

$k^2 - 4k - 12 > 0$ As required

(b) $(k-6)(k+2) > 0$

$k = 6$ or $k = -2$



$\therefore$ either $k < -2$ or $k > 6$

JAN 07

Q5 $2x^2 - 3x - (k+1) = 0$

For no real roots, discriminant < 0

$\therefore (-3)^2 - 4 \times 2 \times -(k+1) < 0$

$9 + 8(k+1) < 0$

$9 + 8k + 8 < 0$

$8k < -17$

$k < -\frac{17}{8}$

MAY 06

Q8(a) $x^2 + 2px + (3p+4) = 0$

for equal roots, discriminant $= 0$

$(2p)^2 - 4 \times 1 \times (3p+4) = 0$

$4p^2 - 12p - 16 = 0$

$\div 4$

$p^2 - 3p - 4 = 0$

$(p-4)(p+1) = 0$

$\therefore$ either $p = 4$ or $p = -1$ but p is a positive constant

$\therefore p = 4$

(b) $x^2 + 2 \times 4x + (3 \times 4 + 4) = 0$

$x^2 + 8x + 16 = 0$

$(x+4)(x+4) = 0$

$\therefore x = -4$

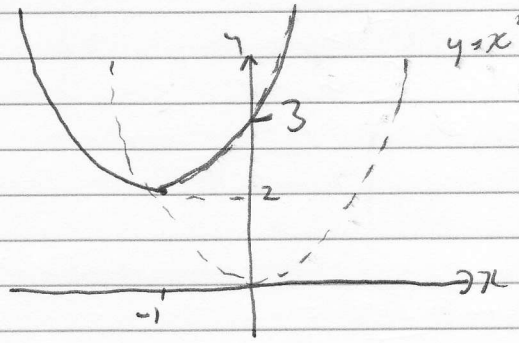
Jan 06

Q10 $x^2 + 2x + 3 \equiv (x+a)^2 + b$

(a) $(x+1)^2 + 2$ by completing the square.

$a = 1, \quad b = 2$

(b) $(x+1)^2 + 2$ transforms x^2 $\begin{pmatrix} -1 \\ 2 \end{pmatrix}$



crosses y axis when $x = 0$ $\quad y = (0+1)^2 + 2 = 3$

(c) discriminant $b^2 - 4ac = 2^2 - 4 \times 1 \times 3$

$= 4 - 12$

$= -8$

$\therefore$ discriminant < 0

and equation has no real roots. This is shown in my sketch by the curve not crossing the x-axis.

(d) $x^2 + kx + 3 = 0$

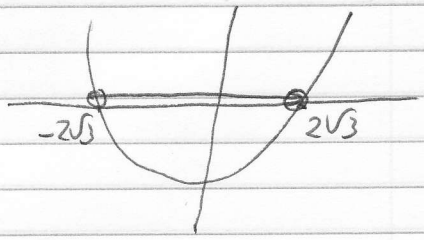
no real roots $\therefore \quad b^2 - 4ac < 0$

$k^2 - 4 \times 1 \times 3 < 0$

$k^2 - 12 < 0$

$k^2 < 12$

$k < \pm 2\sqrt{3}$



$-2\sqrt{3} < k < 2\sqrt{3}$