Hen Gwestiynau Arholiad

The Discriminant

(Gaeaf 2006)

5. Given that the quadratic equation

$$(k+2)x^2 + 4x + k + 5 = 0$$

has no real roots, show that

$$k^2 + 7k + 6 > 0.$$

Find the range of values of k satisfying this inequality. [7]

(Haf 2005)

9. The straight line $y = 2x + c$ is a tangent to the curve $y = x^2 + 6x + 7$.

(a) Determine the value of the constant c. [4]

(b) Find the coordinates of the point of contact of the tangent and the curve. [2]

(Haf 2006)

4. *(a)* Given that the equation

$$kx^2 - 4x + k - 3 = 0$$

has equal roots, find the values of k. [5]

(Gaeaf 2007)

7. Given that the equation

$$kx^2 - 4x + (k-3) = 0$$

has real roots, show that

$$k^2 - 3k - 4 \leqslant 0.$$

Find the range of values of k satisfying this inequality. [7]

(Haf 2007)

8. *(a)* Show that the equation

$$x^2 + (2k+1)x + (k^2 + k + 1) = 0$$

has no real roots whatever the value of k. [4]

(b) Find the range of values of x satisfying the inequality

$$2x^2 + 7x + 3 < 0.$$ [3]

(Gaeaf 2008)

5. *(a)* Find the range of values of k for which the quadratic equation

$$3x^2 + 2x - k = 0$$

has two distinct real roots. [4]

(b) Solve the inequality $x^2 - 5x - 14 \leqslant 0$. [3]

(Haf 2008)

10. *(a)* Solve the inequality $2x^2 - 3x - 9 \geqslant 0$. [3]

(b) (i) Find the range of values of m for which the quadratic equation

$$3x^2 - 6x + m = 0$$

has no real roots.

(ii) The curve C has equation $y = 3x^2 - 4x + 7$. The line L has equation $y = 2x + k$, where k is a constant. Given that L and C do not intersect, find the range of possible values of k. [7]

(Gaeaf 2009)

5. Given that the quadratic equation

$$(3k - 2)x^2 + 8x + k = 0$$

has no real roots, show that

$$3k^2 - 2k - 16 > 0.$$

Find the range of values of k satisfying this inequality. [7]

(Haf 2009)

6. *(a)* Given that $k \neq -1$, show that the quadratic equation

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

has two distinct real roots. [4]

(b) Find the range of values of x satisfying the inequality

$$5x^2 + 7x - 6 \leqslant 0.$$ [3]

(Gaeaf 2010)

5. *(a)* Find the range of values of k for which the quadratic equation

$$kx^2 + 3x - 5 = 0$$

has no real roots. [4]

(b) Solve the inequality $2x^2 - x - 6 > 0$. [3]

(Haf 2010)

6. *(a)* Find the range of values of k for which the quadratic equation

$$2x^2 + kx + 18 = 0$$

has no real roots. [4]

(b) Solve the inequality $10x^2 - x - 3 \geqslant 0$. [3]

(Gaeaf 2011)

3. Given that the quadratic equation

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

has two distinct real roots, show that

$$5k^2 + 2k - 3 < 0.$$

Find the range of values of k satisfying this inequality. [7]

(Haf 2011)

5. The curve C has equation

$$y = x^2 + (4k + 3)x + 7,$$

and the line L has equation

$$y = x + k,$$

where k is a constant.
Given that L and C intersect at two distinct points,

(a) show that $4k^2 + 5k - 6 > 0$, [6]

(b) find the range of values of k satisfying this inequality. [3]

(Gaeaf 2012)

6. Given that the quadratic equation

$$(k + 6)x^2 + 4x + (k + 3) = 0$$

has no real roots, show that

$$k^2 + 9k + 14 > 0.$$

Find the range of values of k satisfying this inequality. [7]

(Haf 2012)

6. *(a)* Show that the equation

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

has no real roots, whatever the value of the constant k. [4]

(b) Find the range of values of x satisfying the inequality

$$3x^2 + 16x - 12 > 0.$$ [3]

(Gaeaf 2013)

5. *(a)* Find the range of values of k for which the quadratic equation

$$5x^2 + 6x - 3k = 0$$

has two distinct real roots. [4]

(b) Solve the inequality $2x^2 - 11x + 15 \leqslant 0$. [3]

(Haf 2013)

6. *(a)* (i) Assuming that the quadratic equation

$$(k + 1)x^2 + (4k + 1)x + (k - 5) = 0$$

has **two equal** roots, show that

$$4k^2 + 8k + 7 = 0.$$

(ii) Hence show that there are **no real** values of k such that the quadratic equation

$$(k + 1)x^2 + (4k + 1)x + (k - 5) = 0$$

has two equal roots. [6]

(b) Find the range of values of x satisfying the inequality

$$4x^2 - 9x - 9 \geqslant 0.$$ [3]

(Gaeaf 2014)

6. Given that the quadratic equation

$$(2k - 3)x^2 + 8x + (2k + 3) = 0$$

has no real roots, show that k satisfies an inequality of the form

$$m - nk^2 < 0,$$

where m, n are integers whose values are to be found.

Hence find the range of values of k such that the quadratic equation

$$(2k - 3)x^2 + 8x + (2k + 3) = 0$$

has no real roots. [6]

(Haf 2014)

6. Given that the quadratic equation

$$(k-1)x^2 + 2kx + (7k-4) = 0$$

has no real roots, show that

$$6k^2 - 11k + 4 > 0.$$

Find the range of values of k satisfying this inequality. [7]

(Haf 2015)

5. *(a)* Find the range of values of k for which the quadratic equation

$$kx^2 + (2k-5)x + (k-6) = 0$$

has **no real roots**. [4]

(b) Without carrying out any further calculation, write down the value of k for which the quadratic equation

$$kx^2 + (2k-5)x + (k-6) = 0$$

has **two equal roots**. [1]

(Haf 2016)

6. *(a)* Find the range of values of k for which the quadratic equation

$$9x^2 + 8x - 2k = 0$$

has **two distinct real roots**. [4]

(b) Solve the inequality $x(5x-7) \geqslant 6$. [4]

(Haf 2019)

6. *(a)* Show that the equation

$$x^2 + (2k-5)x + (k^2 - 5k + 8) = 0$$

has no real roots, whatever the value of the constant k. [4]

(b) Find the range of values of x satisfying the inequality

$$2x^2 + 13x - 24 < 0.$$ [3]