

Pure 3 - Inequalities

Please **complete** this homework by _____. Start it early. If you can't do a question you will then have time to ask your teacher for help or go to a drop in session.

Section 1 – Review of previous topics. Please complete all questions.

1 Find the set of values of x for which:

- a) $2y - 3 < y + 4$ and $5y + 1 \geq y + 3$
b) $x - 2 < 3x - 8$ and $x + 11 \geq 15 - x$
c) $7(x + 3) - 2(3x - 1) > 0$ and $4(5 - 2x) > 3(7 - 2x)$

2. Solve the simultaneous equations:

$$x - 3y = 1$$
$$x^2 + y^2 = 5$$

Section 2 – Consolidation of this week's topic. Please complete all questions.

1. Find the set of values of x for which: **(3 marks each)**

- a) $x^2 - 4x + 3 < 0$ b) $x^2 - 4 \leq 0$ c) $x^2 + 4x > 12$ d) $x^2 + 10x + 21 \geq 0$ e) $22 + 9x - x^2 > 0$
f) $30 + 7x - x^2 > 0$.

2. Find the set of values of x (or p) for which: **(a, b, c, d 3 marks each)**

- a) $2x^2 - 9x + 4 \leq 0$ b) $2 - p - 3p^2 \geq 0$ c) $x(x + 4) \leq 7 - 2x$ d) $2(13 + 2x) < (6 + x)(1 - x)$
e) $x^2 + x - 6 > 0$ and $2x^2 + 7x - 4 > 0$ **(5 marks for e)**

3. Giving your answers in terms of surds, find the set of values of x for which **(3 marks each)**

- a) $x^2 + 2x - 1 < 0$ b) $11 - 6x - x^2 > 0$ c) $x^2 + 4x + 1 \geq 0$

4. Find the value or set of values of k such that **(2 marks each)**

- a) the equation $x^2 - 6x + k = 0$ has equal roots,
b) the equation $x^2 + 2x + k = 0$ has real and distinct roots,
c) the equation $x^2 - 3x + k = 0$ has no real roots,
d) the equation $x^2 + kx + 4 = 0$ has real roots,
e) the equation $x^2 + kx - 3k = 0$ has no real roots,
f) the equation $x^2 + kx + 2k - 3 = 0$ has no real roots,

- g) the equation $x^2 + 2x + k - 2 = 0$ has real and distinct roots,
h) the equation $2x^2 - kx + k = 0$ has equal roots,
i) the equation $3x^2 + (k-1)x + 3 = 0$ has real roots.

4. Find the set of integers, n , for which $2n^2 - 5n < 12$. (4)

5. Given that $x - y = 8$, and that $xy \leq 240$, find the maximum value of $(x + y)$. (4)

Total: (70)

Section 3 – Extension questions. If you are aiming for a top grade, you should attempt these questions.

1. Given that the equation $2x(x + 1) = kx - 8$ has real and distinct roots,
a) show that $k^2 - 4k - 60 > 0$,
b) find the set of possible values of k .

2. A party hat is designed in the shape of a right circular cone of base radius r cm and slant height $(3r - 4)$ cm.
Given that the height of the cone must not be more than 24 cm, find the maximum value of r .