Higher Ink Exercise
Block 1 - Quadratics

Calculators should only be used when necessary

1. a) Write $f(x) = x^2 + 6x + 11$ in the form $(x + a)^2 + b$. **(2)**

b) Hence or otherwise sketch the graph of $y = f(x)$. **(3)**

2. Solve: $x^2 + 5x + 6 < 0$. **(3)**

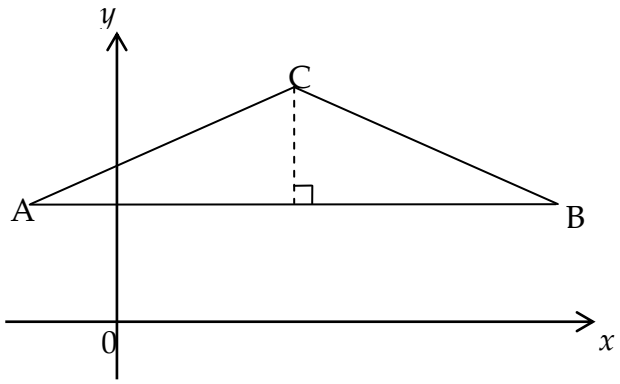
3. For what value of k does the equation $x^2 - 5x + (k+6) = 0$ have equal roots? **(3)**

4. Show that the line with equation $y = 2x + 1$ does not intersect the parabola with equation $y = x^2 + 3x + 4$. **(4)**

5. Prove that the roots of the equation $mx^2 + (m - 2)x - (m + 1) = 0$ are real for all values of m. **(4)**

6. Show that the line with equation $4x - y - 1 = 0$ is a tangent to the parabola with equation $y = 2x^2 + 12x + 7$ and find the point of contact. **(5)**

7. A(–2, 4), B(10, 4) and C(4, 8) are the vertices of triangle ABC shown in the diagram.



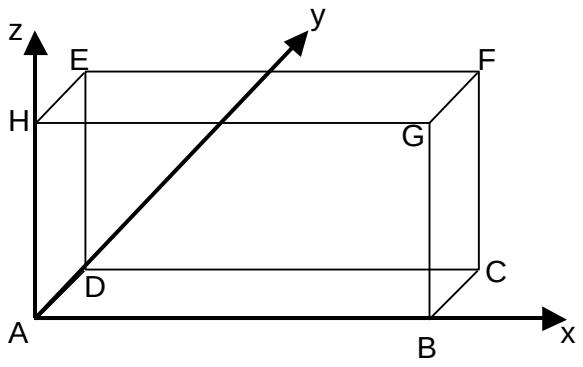
(a) Write down the equation of the altitude from C. **(1)**

(b) Find the equation of the perpendicular bisector of BC. **(4)**

(c) Find the point of intersection of the lines found in (*a*) and (*b*). **(2)**

8. The diagram shows a cuboid ABCD, HGFE relative to the coordinate axes.

F is the point (15, 6, 8).



(a) State the coordinates of B and D **(2)**

(b) Express $\overrightarrow{BD}$ and $\overrightarrow{BF}$ in component form. **(2)**

(c) Calculate the size of angle DBF. **(5)**

TOTAL = 40 MARKS