Remainder and Factor Theorem, Matrices and Co-ordinate Geometry
Sept 2015

1) It is given that $\mathbf{A} = \begin{pmatrix} 4 & -2 \\ 8 & -3 \end{pmatrix}$, $\mathbf{B} = \begin{pmatrix} 2 & 0 & 4 \\ 5 & -1 & 4 \end{pmatrix}$ and $\mathbf{C} = \begin{pmatrix} 5 \\ -2 \\ 3 \end{pmatrix}$.

(i) Calculate **ABC**. [4]

(ii) Calculate $\mathbf{A}^{-1}\mathbf{B}$. [4]

2) **Solutions to this question by accurate drawing will not be accepted.**

The points $A(-3, 2)$ and $B(1, 4)$ are vertices of an isosceles triangle ABC, where angle $B = 90°$.

(i) Find the length of the line AB. [1]

(ii) Find the equation of the line BC. [3]

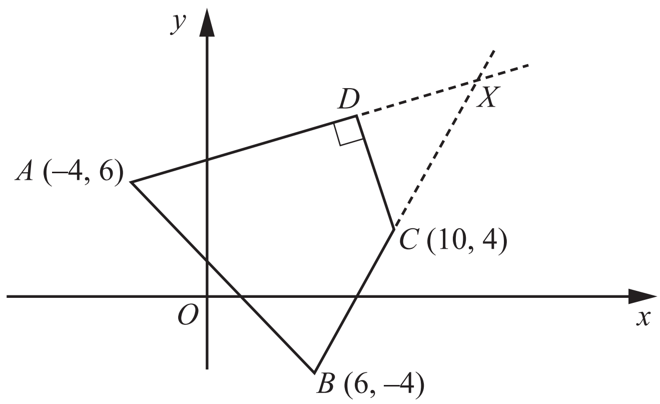
3) The function $f(x) = ax^3 + 4x^2 + bx - 2$, where a and b are constants, is such that $2x - 1$ is a factor. Given that the remainder when $f(x)$ is divided by $x - 2$ is twice the remainder when $f(x)$ is divided by $x + 1$, find the value of a and of b. [6]

4) The expression $2x^3 + ax^2 + bx + 21$ has a factor $x + 3$ and leaves a remainder of 65 when divided by $x - 2$.

(i) Find the value of a and of b. [5]

(ii) Hence find the value of the remainder when the expression is divided by $2x + 1$. [2]

5) **Solutions to this question by accurate drawing will not be accepted.**



The diagram shows a quadrilateral $ABCD$, with vertices $A(-4, 6)$, $B(6, -4)$, $C(10, 4)$ and D. The angle $ADC = 90°$. The lines BC and AD are extended to intersect at the point X.

(i) Given that C is the midpoint of BX, find the coordinates of D. [7]

(ii) Hence calculate the area of the quadrilateral $ABCD$. [2]