# A - Level Further Maths 15 Minute Boost 5

| | |
|---|---|
| For a polynomial with real coefficients, complex roots occur in ..... | complex conjugate pairs |
| When is a matrix singular? | $M$ singular $\Leftrightarrow \det(M) = 0$ |
| State Viète's formulae for the cubic $p(x) = ax^3 + bx^2 + cx + d$ with roots $\alpha, \beta$ and $\gamma$. | $\alpha + \beta + \gamma = -\frac{b}{a}$<br>$\alpha\beta + \alpha\gamma + \beta\gamma = \frac{c}{a}$<br>$\alpha\beta\gamma = -\frac{d}{a}$ |
| Express the area of the triangle $ABC$ in vector form. | Area $= \frac{1}{2}\left\lvert \overrightarrow{AB} \times \overrightarrow{AC} \right\rvert$ |
| $(\mathbf{AB})^T =$ | $B^T A^T$ |

**1** Find $\begin{vmatrix} 2 & 2 & -1 \\ 4 & 2 & 1 \\ 3 & 4 & -2 \end{vmatrix}$

$$\begin{vmatrix} 2 & 2 & -1 \\ 4 & 2 & 1 \\ 3 & 4 & -2 \end{vmatrix} = 2\begin{vmatrix} 2 & 1 \\ 4 & -2 \end{vmatrix} - 2\begin{vmatrix} 4 & 1 \\ 3 & -2 \end{vmatrix} - 1\begin{vmatrix} 4 & 2 \\ 3 & 4 \end{vmatrix}$$

$$= 2(-8) - 2(-11) - 1(10)$$

$$= -4$$

**2** Let $f(x) = x^{\frac{1}{2}} + 3x^{\frac{3}{2}}$ is rotated about the $x-$axis between the lines $x = 4$ and $x = 9$. Find the volume of revolution formed.

$$V = \pi \int_4^9 \left(x^{1/2} + 3x^{3/2}\right)^2 dx$$

$$= \pi \int_4^9 x + 6x^2 + 9x^3$$

$$= \pi \left[ \frac{x^2}{2} + \frac{6x^3}{3} + \frac{9x^4}{4} \right]_4^9$$

$$= \frac{6219}{4}\pi$$