**Useful Vector Formulae for Further Maths**

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| Angle between two vectors | $$cosθ=\frac{a∙b}{\left|a\right|\left|b\right|}, sinθ=\frac{a×b}{\left|a\right|\left|b\right|}$$ |
| Cross product of two vectors = area of parallelogram formed by the vectors | $$a×b=\left|a\right|\left|b\right|sinθ\hat{n} $$ |
| Volume of parallelopiped(aka the scalar triple product) | $$a∙b×c$$ |
| Volume of tetrahedron | $$\frac{1}{6}\left(a∙b×c\right)$$ |
| Some properties of the cross product | $$a×b=-\left(b×a\right)$$$$ma×nb=mn\left(a×b\right)$$$$a×\left(b+c\right)=a×b+a×c$$ |
| Vector equation of line takes the form | $$r=\left(\begin{matrix}1\\2\\3\end{matrix}\right)+λ\left(\begin{matrix}4\\5\\6\end{matrix}\right)$$$$r=a+λd$$$$⟺r-a=λd$$$$⟺\left(r-a\right)×d=0$$$$\frac{x-1}{4}=\frac{y-2}{5}=\frac{z-3}{6}$$ |

$a×b=0⟺$ Vectors parallel

$a∙b=0⟺$ Vectors perpendicular

$a∙\left(a×b\right)=0⟺a,b,c$ coplanar (because vol parallelopiped $=0$)