

Problem Set 3 - Math Tutorial Calculus II

0. Let \vec{a} , \vec{b} and \vec{c} be vectors in \mathbb{R}^3 . Does $\vec{a} \times (\vec{b} \times \vec{c}) = (\vec{a} \times \vec{b}) \times \vec{c}$ hold? What does your result imply for the term $\vec{a} \times \vec{b} \times \vec{c}$?
1. Find an equation for the plane that is perpendicular to the line $x = 3t - 5$, $y = 7 - 2t$, $z = 8 - t$ and that passes through the point $(1, -1, 2)$.
2. Find a value for A so that the planes $8x - 6y + 9Az = 6$ and $Ax + y + 2z = 3$ are parallel.
3. Find the distance between the point $(-11, 10, 20)$ and the line ℓ : $x = 5 - t$, $y = 3$, $z = 7t + 8$.
4. Determine the distance between the two lines $\vec{\ell}_1(t) = t(8, -1, 0) + (-1, 3, 5)$ and $\vec{\ell}_2(t) = t(0, 3, 1) + (0, 3, 4)$.
5. Show that the distance d between the two parallel planes determined by the equations $Ax + By + Cz = D_1$ and $Ax + By + Cz = D_2$ is

$$d = \frac{|D_1 - D_2|}{\sqrt{A^2 + B^2 + C^2}}.$$

6. Find the Cartesian coordinates of the points $(\sqrt{3}, 5\pi/6)$ and $(2, -3\pi/4)$ (which are given in polar coordinates).
7. Find the polar coordinates of the points $(2\sqrt{3}, 2)$ and $(-1, -2)$ (which are given in Cartesian coordinates).
8. Draw the graphs of the following curves in a cartesian coordinates system.
 - (i) $r^2 = \cos(2\theta)$
 - (ii) $r = 1 + \cos \theta$
 - (iii) $r = \cos(3\theta)$
 - (iv) $r = \cos(2\theta)$.