

MATH 212 Quiz 7 NAME:

1. Given $\vec{A} = \langle 2, 3, 0 \rangle$ and $\vec{B} = \langle -2, 7, 1 \rangle$, find the cross product $\vec{A} \times \vec{B}$.

$$\bullet \vec{A} \times \vec{B} = \begin{vmatrix} i & j & k \\ 2 & 3 & 0 \\ -2 & 7 & 1 \end{vmatrix} = \langle 3, -2, 20 \rangle.$$

2. Find an equation of the plane through the point $(9, 3, -1)$ and parallel to the plane $x - y + 3z = 9$.

• A normal vector to this plane is $\langle 1, -1, 3 \rangle$. Hence equation of the plane is given by $(x - 9) - (y - 3) + 3(z + 1) = 0$.

3. Find the distance from the point $P = (2, 8, 5)$ to the plane $x - y - z = 1$.

• We find a point P_0 on the plane, e.g. let $y = z = 0$ in $x - y - z = 1$ to get $x = 1$ so that $P_0 = (1, 0, 0)$. Hence $\vec{P_0P} = \langle 1, 8, 5 \rangle$. A normal vector $\vec{n}$ to the plane is $\vec{n} = \langle 1, -1, -1 \rangle$, so that the distance from P to the plane can be computed from $\frac{|\vec{P_0P} \cdot \vec{n}|}{|\vec{n}|} = 4\sqrt{3}$.

4. Given $f(x, y, z) = xy^2z^3 + 3xz + yz$, find all the first partial derivatives of f .

$$\begin{aligned} \bullet \frac{\partial f}{\partial x}(x, y, z) &= y^2z^3 + 3z \\ \bullet \frac{\partial f}{\partial y}(x, y, z) &= 2xyz^3 + z \\ \bullet \frac{\partial f}{\partial z}(x, y, z) &= 3xy^2z^2 + 3x + y \end{aligned}$$