

P-Exam I

① Find $\vec{u} \cdot \vec{v}$ $u \times v$ $\vec{u} = \langle 1, 7, 3 \rangle$, $\vec{v} = \langle 2, -3, 1 \rangle$

② Find a line through $P(3, -2, 1)$ and $Q(1, -3, 1)$

③ Find a plane through $P(1, 1, -1)$ $Q(2, 0, 2)$ $R(-1, 6, 3)$

④ Find the distance from $(2, 1, 3)$ to the line $\begin{cases} x=2+3t \\ y=1+6t \\ z=-3+5t \end{cases}$

⑤ Find the distance from $(2, 2, 3)$ to the plane

$$2x + 2y + z = 4$$

⑥ Find the arc length of $r(t) = (\cos t + t \sin t)\vec{i} + (\sin t - t \cos t)\vec{j}$
for $0 \leq t \leq \pi$

⑦ Find \vec{T} , \vec{N} and k of $r(t) = (6 \sin 2t, 6 \cos 2t, 5t)$

⑧ Find f_x , f_y , f_{xx} , f_{yy} and f_{xy} of

$$f(x, y) = \cos^2(3x - y^2)$$

⑨ $W = \ln(x^2 + y^2 + z^2)$ $x = ue^v \sin u$, $y = ue^v \cos u$, $z = ue^v$

find $\frac{\partial W}{\partial u}$ $\frac{\partial W}{\partial v}$

⑩ find direction derivative of $f(x, y) = \frac{x-y}{xy+2}$ at $(1, -1)$ with $\vec{u} = (1, 2, 5)$
find direction of increase most rapidly, decrease most rapidly, no change.

