① Find area of parallelogram with vertices

$A(-2,1)$, $B(0,4)$, $C(4,2)$, and $D(2,-1)$. Hint: to

take cross products of $\mathbb{R}^2$ vectors, consider them

embedded in $\mathbb{R}^3$ with z-coordinates 0.

② Let P be a point not on the line L that

passes through Q and R. Show that the

distance d from P to L is

$$d = \frac{\|\vec{a} \times \vec{b}\|}{\|\vec{a}\|}$$

where $\vec{a} = \vec{QR}$ and $\vec{b} = \vec{QP}$. Use that

formula to find the distance of $P(1,1,1)$ to

the line through $Q(0,6,8)$ and $R(-1,4,7)$

③ Find the parametric equation of the line

a) through $(6,-5,2)$ parallel to $3i+2j-\vec{k}$

b) through $(1,2,3)$ and $(-4,3,0)$

c) through $(1,9,6)$ perpendicular to the

   plane $x + 3y + z = 5$

d) through $(2,1,0)$, perpendicular to both $i + j$

   and $j + h$

④ Are the following lines parallel, skew, or intersecting. If they intersect, find that point.

a) $L_1: \langle -6t, 1+9t, -3t \rangle$

$\quad L_2: \langle 1+2s, 4-3s, s \rangle$ —

b) $L_1: \langle 1+2t, 3t, 2-t \rangle$

$\quad L_2: \langle -1+s, 4+s, 1+3s \rangle$

⑤ Find an equation of the plane.

a) through $(6,3,2)$ perpendicular to $\langle -2,1,5 \rangle$

b) through $(-1,6,-5)$ parallel to $x+y+z+2=0$

c) through $(3,-1,2)$, $(8,2,4)$, and $(-1,-2,-3)$

d) through $(6,0,-2)$ containing the line
$\quad l(t) = (4,3,7) + t\langle -2,5,4 \rangle$

⑥ Find the cosine of the angle between the planes $x+y+z=0$ and $x+2y+3z=1$

⑦ Sketch the following planes

a) $2x + 5y + z = 10$

b) $3x + y + 2z = 6$