Analytic Geometry

9.1 Check if the points A, B, and C are on a one line:
a) $A = (-1, 1, 1),\ B = (2, 1, 0),\ C = (0, 1, 0)$
b) $A = (0, 2, -1),\ B = (-2, 4, 1),\ C = (1, 1, -2)$

9.2 Calculate area of triangle ABC if $A = (0, 0, 2),\ B = (2, 1, 1)$ and $C = (1, 1, -2)$

9.3 Find the angles in triangle ABC where $A = (3, 2, 1),\ B = (-1, 6, 5)$ and $C = (-1, 1, 0)$

9.4 Write the equation of plane

a) containing points $(1, 1, 0),\ (-1, 2, 3)$ and $(4, 2, 1)$

b) which contains point $(1, 2, 1)$ and $(1, 1, 1)$ and is perpendicular to the plane $x - y + z = 7$

c) containing line $x = 2 + t,\ y = -1 + 2t,\ z = -t$ and perpendicular to $2x - y + z - 3 = 0$

9.5 Write the parametric equation of line

a) going through points $A = (-2, 1, 0)$ and $B = (1, 2, -1)$

b) which contains point $P = (0, 0, -1)$ and is perpendicular to the vectors $[0, 1, -5]$ and $[-2, 3, 0]$

c) which is bisector of the angle between lines $l_1 :\ x = -t,\ y = 2t,\ z = 3t$
and $l_2 :\ x = -2 + 2s,\ y = 4 - 6s,\ z = 6 + 4s$

9.6 Find the orthogonal projection
a) of a line $\dfrac{x}{2} = \dfrac{y-1}{-1} = \dfrac{z+1}{2}$ onto a plane $x + y + z = 0$
b) of a line $x = 3 + t,\ y = -1 + 2t,\ z = 4 + 4t$ onto a plane $2x + y + z - 7 = 0$

9.7 Find a distance between
a) point $P = (1, 0, -5)$ and plane $x - 2y + z - 1 = 0$
b) parallel planes $2x - y + 3z = 0$ and $-4x + 2y - 6z + 8 = 0$
c) point $P = (0, 1, -1)$ and line $l :\ x = 2t,\ y = -t,\ z = 3t$
d) lines: $l_1 :\ x = -1 + t,\ y = -1 + 2t,\ z = -t$ and $l_2 :\ x = -t,\ y = 1 - 2t,\ z = 3 + t$
e) lines: $l_1 :\ x = 9 + 4t,\ y = 2 - 3t,\ z = t$ and $l_2 :\ x = -2t,\ y = -7 + 9t,\ z = z + 2t$

9.8 Find relative position of line and plane:
a) $l :\ x = 2 + t;\ y = 4 + t,\ z = -2t$ and $\pi :\ x + 2y + z - 7 = 0$
b) $l :\ x = 1 + 4t;\ y = 1 + t,\ z = 1 - t$ and $\pi :\ x - 2y + 2z - 1 = 0$
c) $l :\ x = 2 - 4t;\ y = 3 - t,\ z = t$ and $\pi :\ x + 2y - 2z - 1 = 0$

9.9 Find relative position of lines:
a) $l_1 :\ x = 1 + t;\ y = t,\ z = 2$ and $l_2 :\ x = t\ y = 7 - t,\ z = 1 + t$
b) $l_1 :\ x = t;\ y = 1 + t,\ z = t$ and $l_2 :\ x = 1\ y = -t,\ z = 1$