

CSE-4303 CSE5365 Computer Graphics
Practice Problems 02

Solve the following problems. Assume a right-handed 3-dimensional Cartesian coordinate system.

1. Find the parametric equation of a line in a 3-dimensional Cartesian coordinate system which is passing through points $A (6, -5, -3)$ and point $B (-5, 7, 9)$
2. Find the equation for the line that is parallel to the line $\begin{cases} x(t) = 4t - 5 \\ y(t) = -3t + 2 \\ z(t) = 6t + 4 \end{cases}$ and passes through the point $P (6, -5, -3)$
3. Find the equation of the plane that is parallel to the plane $4x + 7y - 6z - 3 = 0$ and passes through the point $P (1, 4, -2)$.
4. Find the intersection point of line $\begin{cases} x(t) = 3t - 7 \\ y(t) = 0 \\ z(t) = -5t + 5 \end{cases}$ and line $\begin{cases} x(t) = 2t - 3 \\ y(t) = 0 \\ z(t) = 4t + 7 \end{cases}$
5. Find the intersection point of line $\begin{cases} x(t) = 3t - 7 \\ y(t) = 6t - 2 \\ z(t) = -5t + 5 \end{cases}$ and line $\begin{cases} x(t) = 2t - 3 \\ y(t) = 4t - 1 \\ z(t) = 4t + 7 \end{cases}$. If the lines do not intersect, explain why.
6. Find the equation of a plane which is passing through points $A (5, 2, -3)$, $B (6, 8, 3)$, $C (2, 7, 1)$
7. Find the equation of a plane which is passing through z axis and point $A (6, 2, 3)$
8. Find the equation for the line of intersection of the two planes:
 $4x + 7y - 6z - 3 = 0$ and $2x - 5y - z + 3 = 0$
9. Find the intersection of line $\begin{cases} x(t) = 2t - 3 \\ y(t) = 4t - 1 \\ z(t) = 4t + 7 \end{cases}$ and plane $2x - 5y - z + 3 = 0$
10. Given point $A (2, 8, 10)$ and plane P as: $4x + 7y - 6z - 3 = 0$. Find the equation of a line which is passing through point A and is perpendicular to plane P .
11. Equation of line AB is given as: $\begin{cases} x(t) = 4t - 5 \\ y(t) = -3t + 2 \\ z(t) = 6t + 4 \end{cases}$

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Find the equation of line AB after it has been rotated 30 degrees around the y axis.

12. Point $A(8, -5)$ is given in a two dimensional world coordinate system. Find the coordinates of the point A on the screen after it is mapped from window to viewport.

Window coordinates:

$$x_{wmin} = 4, \quad y_{wmin} = -8, \quad x_{wmax} = 20, \quad y_{wmax} = -1$$

Normalized device coordinate of the viewport:

$$x_{vmin} = 0.2, \quad y_{vmin} = 0.25, \quad x_{vmax} = 0.6, \quad y_{vmax} = 0.8$$

The origin of the screen coordinate system is defined in the upper left corner of the screen and the screen resolution is 1600 by 1200. Use truncation to convert from float to integer.

13. Equation of plane P is given as $2x + 6y + 3z + 12 = 0$. Find the equation of this plane after it has been rotated 60 degrees around x axis.
14. Equation of plane P is given as $3x - 7y + 2z + 8 = 0$. Find the equation of this plane after it has been translated by $dx = 3, dy = -4, dz = 8$
15. Given point $A = (1,5,9)$ and plane P as $3x + 4y - 6z + 9 = 0$. Find the distance of point A from plane P .