1. Write the set of points for a curve in explicit form.
2. Write the set of points for a curve in parametric form.
3. Write the set of points for a curve in implicit form.
4. Write the set of points for a surface in explicit form.
5. Write the set of points for a surface in parametric form.
6. Write the set of points for a surface in implicit form.
7. How do we transform curves and surfaces given in different representations?
8. What is the normal vector of a line/plane?
9. How do we define the normal vector at a given point of a surface?
10. How do we calculate the normal vector at a point of a surface given in parametric or implicit form?
11. Given a curve or surface in explicit form, write its parametric and implicit equations.
    *Show that the normal vector computed from these equations is the same.
12. What are the different representations of a line in plane?
13. Given a line in the plane defined by a point $\boldsymbol{p} = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$ and a normal vector $\boldsymbol{n} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$, what is a homogeneous implicit equation of the line? What is the Hesse normal form of this equation?
14. What are the different representations of a line in space?
15. What are the different representations of a plane in space?
16. Can a line be defined by a point and a normal vector in space?
17. Given two points of a line in the plane, $\begin{bmatrix} 1 \\ 2 \end{bmatrix}$ and $\begin{bmatrix} 4 \\ 3 \end{bmatrix}$, write the implicit, explicit, and parametric equations of the line. Write a normal vector of the line. Decide whether the following points lie on the line: $(5, 10)$, $(-3, 1)$, $(7, 12)$.
18. Given a plane through the points $\begin{bmatrix} 3 \\ 3 \\ 2 \end{bmatrix}$, $\begin{bmatrix} 6 \\ 4 \\ 6 \end{bmatrix}$, and $\begin{bmatrix} 2 \\ 9 \\ 5 \end{bmatrix}$, write a parametric equation of the plane using spanning vectors.
19. For the previous plane, write implicit, explicit, and parametric equations. Write a normal vector of the plane. Give two points on the plane and two points in each of the half-spaces determined by the plane.
20. Given a line in plane with the equation $3x + 4y + 5 = 0$, what is a normal vector of the line? Give one point on the line.
21. Given a plane in space with the equation $x + 5y + 3z - 9 = 0$, what is a normal vector of the plane? Give one point on the plane.
22. What are the implicit, explicit, and parametric equations of the parabola containing the origin, with axis along the y-axis and focus at $(0, p)$?
23. What is the parametric form of the ellipse with center point $(4, 3)$, axes $\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$ and $\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$, major axis $a = 4$, and minor axis $b = 3$?
24. Consider the surface defined by $f(x, y, z) = x^2 + y^2 - z$. Which of the following points lie on the surface? $(0, 0, 0)$, $(4, 1, 2)$, $(-2, 2, 0)$, $(-2, 2, 8)$, $(0, 1, 1)$.
25. What is ideal reflection? Derive the direction of the ideal reflection and illustrate with a figure.
26. What is ideal refraction? Derive the direction of the ideal refraction, given the surface normal, the incident ray direction, and the relative refractive index.
27. Given a ray with direction vector $\boldsymbol{v} = \begin{bmatrix} 0 \\ -1 \\ 0 \end{bmatrix}$ that intersects the surface at a point $\boldsymbol{p}$ with surface normal $\begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$. What is the direction vector $\boldsymbol{v}_r$ of the ideal reflected ray? (Note: the formula given in the slides requires the surface normal to be of unit length!)