

1. (5 marks) Consider the line L and the plane P below:

$$L : \quad (x, y, z) = (5, 2, 1) + t(1, -2, 1)$$

$$P : \quad x + 2y + 2z = 2.$$

Find the intersection of P and L .

2. (5 marks) A plane P has normal direction $(-1, 2, 3)$. It is known that the point $(1, -5, 2)$ is on P . Find the equation for P in the form

$$z = ax + by + c$$

3. (5 marks) Describe the following quadric surfaces as

- an ellipsoid,
- cone,
- elliptic paraboloid,
- hyperbolic paraboloid,
- hyperboloid of one sheet,
- or hyperboloid of two sheets

(a) $x^2 + 4y^2 + z = 0$

(b) $x^2 - 4y^2 + z = 1$

(c) $x^2 + 4y^2 + z^2 = 1$

(d) $x^2 + 4y^2 - z^2 = 1$

(e) $x^2 + 4y^2 - z = 1$

4. (10 marks) Evaluate

$$\int_1^2 \int_0^2 \int_0^1 xy^2z \, dx \, dy \, dz$$

9. (10 marks) Set up as an integrated integral

$$\iiint_T f(x, y, z) \, dV$$

where T is the tetrahedron defined by $x \geq 0$, $y \geq 0$, $z \geq 0$ and $x + 2y + 4z \leq 4$.