1. Evaluating line integral $\int_c yzdx + zxdy + xydz$ where the integral path,

   C: $\frac{x-1}{2} = \frac{y-3}{6} = \frac{z-2}{4}$,indicates from (0,0,0) → (1,3,2)

2. Consider a system in state variable form: $\dot{X} = \begin{bmatrix} 0 & 1 & 0 \\ 2 & 0 & 1 \\ -k & -3 & -2 \end{bmatrix} X + \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix} u$,

   $Y = \begin{bmatrix} 1 & 2 & 0 \end{bmatrix} X$

   Find the range of k where the system is stable.

3. Evaluate $\iint_s \vec{F} \cdot d\sigma$ where $\vec{F} = xy\vec{i} + xz\vec{j} + (1-z-yz)\vec{k}$; S is the lateral surface of the paraboloid $z=1-x^2-y^2$ for which $z \geqq 0$

4. Solve the equation $\frac{d^2y}{dt^2} - 2\frac{dy}{dt} + 10y = 0$, with the initial conditions $y(0) = 4,\ \frac{dy}{dt}(0) = 1$.

5. Write the following function using unit step functions and find its Laplace transform.

$$f(t) = \begin{cases} 2 & If\ 0 < t < 1 \\ \frac{t^2}{2} & If\ 1 < t < \frac{\pi}{2} \\ \cos t & if\ t > \frac{\pi}{2} \end{cases}$$