1. Evaluate the line integral \( \int_C xy\,dx + y^2\,dy + yz\,dz \), where \( C \) is the line segment from the point \((1, 0, -1)\) to \((3, 4, 2)\).

2. Evaluate the following integral by making a change of variables:
\[
\iint_R \frac{x - 2y}{3x - y}\,dA
\]
where \( R \) is the parallelogram bounded by \( x - 2y = 0, x - 2y = 4, 3x - y = 1, \) and \( 3x - y = 8 \).

3. Use Green’s Theorem to evaluate the line integral
\[
\int_C \sqrt{1 + x^3}\,dx + 2xy\,dy
\]
where \( C \) is boundary of the triangle with vertices \((0, 0), (1, 0), \) and \((1, 3)\), oriented counterclockwise.

4. Find the surface area of the part of the paraboloid \( x = y^2 + z^2 \) that lies inside the cylinder \( y^2 + z^2 = 9 \).

5. Let \( C \) be a simple, closed curve that lies in the plane \( x + y + z = 1 \). Show that the line integral
\[
\int_C z\,dx - 2x\,dy + 3y\,dz
\]
only depends on the area of the region enclosed by \( C \) and not on the shape of \( C \) or its position in the plane.

6. Let \( F(x, y, z) = (xy, 3y, 5y) \), and let \( C \) be the curve of intersection of the plane \( x + z = 5 \) and the cylinder \( x^2 + y^2 = 81 \). Compute \( \oint_C F \cdot dr \).

7. Let \( F(x, y, z) = (\sin y, x\cos y + \cos z, -y\sin z) \). Let \( C \) be the curve given by \( r(t) = (\sin t, t, 2t) \) for \( 0 \leq t \leq 2\pi \).
   (a) Is \( F \) conservative?
   (b) Evaluate \( \int_C F \cdot dr \).

8. Use Stokes’ Theorem to evaluate \( \iint_S \text{curl} F \cdot dS \), where \( F(x, y, z) = (\arctan(x^2yz^2), x^2y, x^2z^2) \) and \( S \) is the cone \( x = \sqrt{y^2 + z^2} \) from \( 0 \leq x \leq 2 \) oriented in the direction of the positive \( x \)-axis.

9. Fix \( a > 0 \). Let \( F = (xz, x, y) \), and let \( S \) be the surface given by:
\[
x^2 + y^2 + z^2 = a^2 \quad y \geq 0
\]
Compute: \( \iint_S F \cdot d\mathbf{r} \)

10. Use the Divergence Theorem to evaluate \( \iiint_S (2x + 2y + z^2)\,dS \) where \( S \) is the sphere \( x^2 + y^2 + z^2 = 1 \).