1. Evaluate the line integral \( \int_C (3x - y) \, ds \) where \( C \) is the quarter-circle \( x^2 + y^2 = 9 \) from \((0, 3)\) to \((3, 0)\).

2. Evaluate the line integral \( \int_C 3y^2 \, ds \) where \( C \) is the portion of \( y = x^2 \) from \((2, 4)\) to \((0, 0)\).

3. Evaluate the line integral \( \int_C 4(x - z)z \, dx \) where \( C \) is the portion of \( y = x^2 \) in the plane \( z = 2 \) from \((1, 1, 2)\) to \((2, 4, 2)\).
4. Compute the work done by the force field $\mathbf{F} = \langle z, 0, 3x^2 \rangle$ along the curve $C$ where $C$ is the quarter-ellipse $x = 2 \cos t$, $y = 3 \sin t$, $z = 1$ from $(2, 0, 1)$ to $(0, 3, 1)$.

5. Determine whether or not the vector field $\mathbf{F} = \langle z^2 + 2xy, x^2 - z, 2xz - 1 \rangle$ is conservative. If it is, find a potential function.

6. Show that $\mathbf{r} = \frac{\langle x, y \rangle}{r^n} = \frac{\langle x, y \rangle}{(x^2 + y^2)^{n/2}}$ is conservative for any integer $n$. 