1. (8 points) Let S be the cylinder $x^2 + y^2 = 1$ with $0 \leq z \leq 1$ with an outer normal vector. Evaluate
$$\iint_S (2x\mathbf{i} - 2y\mathbf{j} + z^2\mathbf{k}) \cdot d\mathbf{S}.$$

2. (6 points) Let S be defined by
$$x = u\cos(v), \quad y = u\sin(v), \quad z = v$$
for $0 \leq u \leq 1$ and $0 \leq v \leq 2\pi$. Evaluate
$$\iint_S \sqrt{x^2 + y^2 + 1}\, dS.$$

3. (6 points) Let $\mathbf{F}(x, y, z) = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$. Let the curve be the straight line from $(0, 0, 0)$ to $(5, 5, 5)$. Evaluate
$$\int_C \mathbf{F} \cdot d\mathbf{s}.$$

Scratch paper
