

15) a.) $z = x^2 + y^2$ $[0,1], [0,1]$

$$\frac{dz}{dx} = 2x \quad \frac{dz}{dy} = 2y$$

$$S_A = \iint_D \sqrt{1 + 4x^2 + 4y^2} \, dy \, dx = \int_0^1 \int_0^1 \sqrt{1 + 4x^2 + 4y^2} \, dy \, dx \quad \text{// } q(x,y)$$

4 squares $\Delta A = \frac{A}{4} = \frac{1}{4}$

$$S_A = \int_0^1 \int_0^1 q(x,y) \, dx \, dy = \frac{1}{4} \left(q\left(\frac{1}{4}, \frac{1}{4}\right) + q\left(\frac{1}{4}, \frac{3}{4}\right) + q\left(\frac{3}{4}, \frac{1}{4}\right) + q\left(\frac{3}{4}, \frac{3}{4}\right) \right)$$

$$q(0.25, 0.25) \approx 1.225$$

$$q(0.25, 0.75) = q(0.75, 0.25) = 1.571$$

$$q(0.75, 0.75) = 2.345$$

$$S_A \approx \frac{1}{4} (1.225 + 2(1.571) + 2.345)$$

$$\boxed{S_A \approx 1.83}$$