Task 3 Polynomial Kernel

$$\langle \phi(x_i), \phi(x_j) \rangle = x_{i1}^2 x_{j1}^2 + \sqrt{2} x_{i1} x_{i2} \sqrt{2} x_{j1} x_{j2} + x_{i2}^2 x_{j2}^2$$

$$= x_{i1}^2 x_{j1}^2 + 2 x_{i1} x_{i2} x_{j1} x_{j2} + x_{i2}^2 x_{j2}^2$$

$$= (x_{i1} x_{j1})^2 + 2 \cdot (x_{i1} x_{j1})(x_{i2} x_{j2}) + (x_{i2} x_{j2})^2$$

$$= (x_{i1} x_{j1} + x_{i2} x_{j2})^2$$

$$= \langle x_i, x_j \rangle^2$$