Chapter 14. Kernels

14.1.
$\boldsymbol{\phi}(x_1) = (1, 0, 0), \boldsymbol{\phi}(x_2) = (1, 2, 2)$.
a. $\mathbf{w} \parallel (0, 2, 2)$.
b. The intersection with decision boundary and the line segment that connects two point is $(1, 1, 1)$, so the margin is $\sqrt{2}$.
c. $\frac{1}{\sqrt{2}} = \|\mathbf{w}\| \Rightarrow \mathbf{w} = (0, \frac{1}{2}, \frac{1}{2})$.
d. $-w_0 \geq 1, 2 + w_0 \geq 1 \Rightarrow w_0 = -1$.
e. $f(x) = -1 + \frac{\sqrt{2}}{2}x + \frac{1}{2}x^2$.

14.2.
Yes, since the dataset is linearly separable, the separating hyperplanes guaranteed to be exist. SVM will correctly find the one that maximizes the margin.