HW #5

1. Bishop 6.18

2. Gaussian processes for regression

Generate $N = 16$ equidistant data points using $f(x) = \sin(x) + \xi$, $x \in [0, \frac{3\pi}{2}]$.

Here, $\xi = \mathcal{N}(\underbrace{0}_{\mu}, \underbrace{0.1^2}_{\sigma^2})$ is random noise.

Fit this data using gaussian processes for regression, with the gaussian kernel:

$$k(\vec{x}_n, \vec{x}_m) = e^{-\frac{\theta_1}{2}\|\vec{x}_n - \vec{x}_m\|^2}$$

[Here, $k(x_n, x_m) = e^{-\frac{\theta_1}{2}(x_n - x_m)^2}$ since data is 1D]

Write out the predictive distribution and plot its mean and $\pm 2\sigma$ (standard deviation) for $\theta_1' = 4$ & $\theta_1'' = 64$ in the $[0, 2\pi]$ range (note the extended range)

Show your work, including the expressions for mean & covariance of the predictive distribution.

Add the data points (with noise) and sin(x) to both plots.