Task 2

To find the max and min, we must apply the first and second derivatives.

$F_a = 2a - 5 - 2b$

$F_b = 4b - 2a$

Then we have 2 equations and 2 unknowns and solve for a = 5, b = 2.5

Now find F_{aa}, F_{bb}, and F_{ab} for the second derivative test.

$F_{aa} = 2$

$F_{bb} = 4$

$F_{ab} = -2$

Now solve for H,

$H = F_{aa} * F_{bb} * F_{ab}^2$

$H = 4$

Because H > 0 and F_{aa} > 0, the value at (5, 2.5) is a minimum and there is no maximum because (5, 2.5) is the only critical point.

Task 3

$$w = (\lambda I + \phi^T \phi)^{-1} \phi^T t$$

As λ approaches infinity, the value of λI scales any matrix it is multiplied with by λ, so because λ approaches infinity, the value of w goes to infinity.

Task 4

Start by solving the error for each function given the values. Our weights here are defined as $w_1x + w_2$. Plugging them into the equation on page 25, we get:

For w = [2.4, -1.5]

$E_D(w) = ½ [(9.6 – [2.4, -1.5][5.3\ 5.3]^T)^2 + (4.2 – [2.4, -1.5][7.1, 7.1]^T)^2 + (2.2 – [2.4, -1.5][6.4, 6.4]^T)^2]$

= ½ (23.3 + 4.8 + 12.7)

= 20.4

And for w = [3.1, 4.2]

$E_D(w) = ½ [(9.6 – [3.1, 4.2][5.3\ 5.3]^T)^2 + (4.2 – [3.1, 4.2][7.1, 7.1]^T)^2 + (2.2 – [3.1, 4.2][6.4, 6.4]^T)^2]$

After the first step, you find that the error for these weights are already higher than the error for previous weights.

$E_D(w) = ½ [(-29.09)^2 + …]$

$= 402.5 + …$

So the function f(x) = 2.4x – 1.5 is the better line.