

1. Exercise 1.3 in LFD

- (a) We can consider 2 cases for this problem, case 1 is that $x(t)$ is misclassified to -1 when it is supposed to be $+1$. In this case, $y(t)$ should equal $+1$, and $x(t)$ should equal -1 , the product of any number with a negative number is always negative. The other case would be $x(t) = +1$, and $y(t) = -1$, where the same rule will apply.
- (b) begin with the left hand side of the inequality

$$\begin{aligned}y(t)w^T(t+1)x(t) &= y(t)(w^T(t) + y(t)x(t))x(t) \\ &= y(t)w^T(t)x(t) + y(t)^2x(t)^2 \\ y(t)w^T(t)x(t) + y(t)^2x(t)^2 &> y(t)w^T(t)x(t)\end{aligned}$$

Since $y(t)^2x(t)^2$ is always positive, the inequality will always hold.

- (c) For any $x(t)$ that is misclassified, $w(t+1)$ will always correctly classified $x(t)$.