$\because M_t = \left\lceil \frac{-y_{n(t)}W_t^T x_{n(t)}}{|x_{n(t)}|^2} \right\rceil = \frac{-y_{n(t)}W_t^T x_{n(t)}}{|x_{n(t)}|^2} + \epsilon$, where $0 \le \epsilon < 1$

$\therefore W_{t+1} = W_t + y_{n(t)}x_{n(t)}M_t = W_t + y_{n(t)}x_{n(t)}\left(\frac{-y_{n(t)}W_t^T x_{n(t)}}{|x_{n(t)}|^2} + \epsilon\right)$

$\therefore |W_{t+1}|^2 = |W_t|^2 + |x_{n(t)}|^2\left(\frac{-y_{n(t)}W_t^T x_{n(t)}}{|x_{n(t)}|^2} + \epsilon\right)^2 + 2y_{n(t)}W_t^T x_{n(t)}\left(\frac{-y_{n(t)}W_t^T x_{n(t)}}{|x_{n(t)}|^2} + \epsilon\right)$

$= |W_t|^2 + |x_{n(t)}|^2\left(\frac{|W_t^T x_{n(t)}|^2}{|x_{n(t)}|^4} + \epsilon^2 + \frac{-2\epsilon y_{n(t)}W_t^T x_{n(t)}}{|x_{n(t)}|^2}\right) + \left(\frac{-2|W_t^T x_{n(t)}|^2}{|x_{n(t)}|^2} + 2\epsilon y_{n(t)}W_t^T x_{n(t)}\right)$

$= |W_t|^2 + \frac{|W_t^T x_{n(t)}|^2}{|x_{n(t)}|^2} + \epsilon^2|x_{n(t)}|^2 - 2\epsilon y_{n(t)}W_t^T x_{n(t)} + \frac{-2|W_t^T x_{n(t)}|^2}{|x_{n(t)}|^2} + 2\epsilon y_{n(t)}W_t^T x_{n(t)}$

$= |W_t|^2 + \frac{|W_t^T x_{n(t)}|^2}{|x_{n(t)}|^2} + \epsilon^2|x_{n(t)}|^2 + \frac{-2|W_t^T x_{n(t)}|^2}{|x_{n(t)}|^2}$

$= |W_t|^2 + \epsilon^2|x_{n(t)}|^2 + \frac{-|W_t^T x_{n(t)}|^2}{|x_{n(t)}|^2}$

$\le |W_t|^2 + \epsilon^2|x_{n(t)}|^2$

$\le |W_t|^2 + max|x_n|^2$

$\because |W_{t+1}|^2 \le |W_t|^2 + max|x_n|^2$, $W_0 = 0$

$\therefore$ Applying the inequality t times, we get:

$|W_t|^2 \le t * max|x_n|^2$

$|W_t| \le \sqrt{t} * max|x_n|$ ----------------(1)

$\because y_{n(t)}W_f{}^T x_{n(t)} \ge min(y_n W_f{}^T x_n) > 0$

$\therefore W_f{}^T W_{t+1} = W_f{}^T\left(W_t + y_{n(t)}x_{n(t)}M_t\right) \ge W_f{}^T W_t + min\left(y_n W_f{}^T x_n\right)M_t$

$\because min(M_t) = 1$

$\therefore W_f{}^T W_{t+1} \ge W_f{}^T W_t + min\left(y_n W_f{}^T x_n\right)$

$\therefore$ Applying the inequality t times, we get:

$W_f{}^T W_t \ge t * min\left(y_n W_f{}^T x_n\right)$

$\frac{W_f{}^T W_t}{|W_f||W_t|} \ge \frac{t*min(y_n W_f{}^T x_n)}{|W_f||W_t|}$ ----------------(2)

$\therefore$Then combine inequation(1) and (2), we get:

$$1 \geq \frac{W_f{}^T W_t}{|W_f||W_t|} \geq \frac{\sqrt{t} * min\left(y_n \frac{W_f{}^T}{|W_f|} x_n\right)}{max|x_n|}$$

$$\therefore \sqrt{t} \leq \frac{max|x_n|}{min\left(y_n \frac{W_f{}^T}{|W_f|} x_n\right)}$$

$$\therefore t \leq \left(\frac{max|x_n|}{min\left(y_n \frac{W_f}{|W_f|}^T x_n\right)}\right)^2$$

∵ The data set is linear separable

∴ t is finite