1.

1] $h_1 = W_h h_0 + W_x X_1$

$\hat{y}_1 = W_y h_1$

$h_2 = W_h h_1 + W_x X_2$

$\hat{y}_2 = W_y h_2$

$$\hat{y}_2 = W_y h_2 = W_y (W_h h_1 + W_x X_2)$$
$$= W_y W_h h_1 + W_y W_x X_2$$
$$= W_y W_h (W_h h_0 + W_x X_1) + W_y W_x X_2$$
$$= W_y W_h^2 h_0 + W_y W_h W_x X_1 + W_y W_x X_2$$

Since $h_0 = 1$, $X_1 = 10$, $X_2 = 10$, $y_1 = 5$, $y_2 = 5$
& $W_h = 1$, $W_x = 0.1$, $W_y = 2$

$$\hat{y}_2 = (2)(1)^2(1) + (2)(1)(0.1)(10) + (2)(0.1)(10)$$
$$= 2 + 2 + 2 = \boxed{6} \#$$

$\hat{y}_2$ ~~$\hat{y}_1$~~ $h_0 = 1, \; x_1 = 10, \; x_2 = 10$

~~h_1~~ $y_1 = 5, \; y_2 = 5$

$w_h = 1$

$w_x = 0.1$

$w_y = 2$

3] $\hat{y}_2 = (2)(1)^2(1) + (2)(1)(0.1)(10) + (2)(0.1)(10)$

$= 2 + 2 + 2 = \boxed{6}$

2] $L_t = \sum_i (\hat{y}_1 - y_i)^2$

$= (\hat{y}_1 - y_1)^2 + (\hat{y}_2 - y_2)^2$

$= (2((1)(1) + (0.1)(10)) - 5)^2 + (6 - 5)^2$

$= (2(1+1) - 5)^2 + (1)^2$

$= (-1)^2 + (1)^2 = \boxed{2}$

(3) $L_t = (\hat{y}_1 - y_1)^2 + (\hat{y}_2 - y_2)^2$

$L_t = (w_y h_1 - y_1)^2 + (w_y w_h^2 h_0 + w_y w_h w_x x_1 + w_y w_x x_2)^2$

$$\frac{\partial L_t}{\partial h_1} = 2(w_y h_1 - y_1)(w_y)$$

~~$+ 2(w_y w_h^2 h_0 + w_y w_h w_x x_1 + w_y w_x x_2)$~~

~~(0)~~

$= 2(2h_1 - 5)(2)$

$= (4h_1 - 10)(2)$

$= 8h_1 - 20$

$= 8(2) - 20$

$= \boxed{-4}$ #

4

$$L_t = (\hat{y}_1 - y_1)^2 + (\hat{y}_2 - y_2)^2$$

$$= (w_y h_1 - y_1)^2 + (w_y w_h^2 h_0 + w_y w_h w_x x_1 + w_y w_x x_2 - y_2)^2$$

$$= (w_y w_h h_0 + w_y w_x x_1 - y_1)^2 + (w_y w_h^2 h_0 + w_y w_h w_x x_1 + w_y w_x x_2 - y_2)^2$$

$$\frac{\partial L_t}{\partial w_h} = 2(w_y w_h h_0 + w_y w_x x_1 - y_1)(w_y h_0)$$

~~$+ 2(w_y h_0)$~~

$$+ 2(w_y w_h^2 h_0 + w_y w_h w_x x_1 + w_y w_x x_2 - y_2) * (2 w_y w_h h_0)$$

$$= 2(-1)(2*1) + 2(1)(2*2*1*1)$$

$$= -4 + 8 = \boxed{+4} \ \#$$