(i) $y[n] = 1.01\, y[n-1] + x[n]$

checking with the impulse response;

$$x[n] = \delta[n]$$
$$y[n] = h[n]$$
$$\therefore h[n] = 1.01\, h[n-1] + \delta[n]$$

assuming causality $h[-1] = 0$

$$h[0] = 1.01 \times h[-1] + \delta[0]$$
$$h[0] = 1$$

$$h[1] = 1.01\, h[0] + \delta[1]$$
$$= 1.01 \times 1$$
$$= 1.01$$

$$h[2] = 1.01 \cdot h[1] + \delta[2]$$
$$= 1.01^2$$

$$h[3] = 1.01^3$$

impulse response $h[n] = 1.01^n$; $\forall\ n \in \mathbb{Z}^+$

(ii) $y[n] = y[n-1] + \frac{1}{2}x[n]$

Checking with the impulse response,

$x[n] = \delta[n]$

$y[n] = h[n]$

assuming causality $h[-1] = 0$

$$h[0] = h[-1] + \frac{1}{2}\delta[0]$$
$$= \frac{1}{2}$$

$$h[1] = h[0] + \frac{1}{2}\delta[1]$$
$$= \frac{1}{2}$$

$$h[2] = \frac{1}{2}$$

$$h[3] = \frac{1}{2}$$

impulse response, $h[n] = \frac{1}{2}$ if $n \in \mathbb{Z}^+$
