1) $y(n) = \frac{1}{3} x[n] + 2x[n-1] - y[n-1]$

$ay(n) = \frac{1}{3} aX[n] + 2aX[n-1] - ay[n-1]$

$y_1[n] = \frac{1}{3} x_1[n] + 2x_1[n-1] - y_1[n-1]$

$y_2[n] = \frac{1}{3} x_2[n] + 2x_2[n-1] - y_2[n-1]$

$y_n[n] = \frac{1}{3} (x_1[n] + x_2[n]) + 2(x_1[n-1] + x_2[n-1]) - y[n-1]$

$y_n[n] = y_1[n] + y_2[n]$

$y_1[n] + y_2[n] = \frac{1}{3} (x_1[n] + x_2[n]) + 2(x_1[n-1] + x_2[n-1]) - (y_1[n-1] + y_2[n-1])$

$y_1[n] + y_2[n] = \frac{1}{3} x[n] + 2x[n-1] - y[n-1]$ ✓ Lineal

$y_1[n] = \frac{1}{3} x[n-n_0] + 2x[n-n_0-1] - y_1[n-1]$

$y_1[n] = y[n-n_0]$ invariante ✓ SLIT ✓

2) $y[n] = \sum_{k=-\infty}^{n} x^2[k]$

$y_a[n] = \sum_{k=-\infty}^{n} (a x[k]^2) = \sum_{k=-\infty}^{n} a^2 x^2[k] = a^2 \sum_{k=-\infty}^{n} = a^2 y[n]$ homo ✓

$y[n] = \sum_{k=-\infty}^{n} (x_1[k] + x_2[k])^2 = \sum_{k=-\infty}^{n} (x_1^2[k] + 2x_1[k]x_2[k] + x_2^2[k])$

$y[n] = y_1[n] + y_2[n] + 2 \sum_{k=-\infty}^{n} x_1[k] x_2[k]$

$y[n] \neq y_1[n] + y_2[n]$ X Lineal

$y_1[n] = \sum_{k=-\infty}^{n} x_1^2[k] = \sum_{k=-\infty}^{n} x^2[k-n_0]$

$y_1[n] = \sum_{m=-\infty}^{n-n_0} x^2[m] = y[n-n_0]$ invariante ✓ SLIT X

3) $y[n] = \text{median}(x[n-1], x[n], x[n+1])$

$\text{median}(ax[n-1], ax[n], ax[n+1]) = a\,\text{median}(x[n-1], x[n], x[n+1])$

$\text{median}(x_1 + x_2) \neq \text{median}(x_1) + \text{median}(x_2)$

Lineal X

$y_1[n] = \text{median}(x_1[n-1], x_1[n], x_1[n+1]) =$

$\text{median}(x[n-1-n_0]\ x[n-n_0], x[n+1-n_0]) = y[n-n_0]$

invariante ✓ SLIT X

4) $y(t) = Ax(t) + B \quad A, B \in \mathbb{R}$

$ax(t) \to y_a(t) = Ax(t) + B \neq ay(t) = aAx(t) + aB$

$y_1(t) + y_2(t) = (Ax_1 + B) + (Ax_2 + B) = Ax_1 + Ax_2 + 2B$

Lineal X

$x(t-t_0) \to y(t) = Ax(t-t_0) + B$

$y(t-t_0) = Ax(t-t_0) + B$

invariable ✓ SLIT X