**Problem** 1 (10 Points) For a discrete time system

$$\begin{aligned} x(k+1) &= ax(k)+u(k) \\ y(k) &= cx(k) \end{aligned}$$

prove that

$$S_a^y = \frac{av(k)}{x(k)}$$

**Problem** 2 (15 Points) For the system shown in the figure, find its (a) type, (b) position error constant $K_p$, (c) velocity error constant $K_v$, (d) acceleration error constant, and find the steady state error of the system to (e) unit step input, (f) unit ramp input, and (g) unit parabolic input.