$$\ddot{y} - 2\dot{y} + y = u + \dot{u} \quad (1)$$

↓ (slide 41)

Show how to derive (1) from (2)

$$\begin{cases} \dot{x}_1 = x_2 \\ \dot{x}_2 = -x_1 + 2x_2 + u \\ y = x_1 + x_2 \end{cases} \quad (2)$$

Write (1) as $\boxed{y = 2\int y - \iint y + \iint u + \int u}$ assuming 0 initial conditions

from (2)

$x_1 = \int x_2$ and $x_2 = -\int x_1 + 2\int x_2 + \int u$

$$y = x_1 + x_2 = \int x_2 + x_2 = -\iint x_1 + 2\iint x_2 + \iint u + \int x_1 + 2\int x_2 + \int u =$$

$$= -\iint x_1 + 2\int x_1 + \iint u - \iint x_2 + 2\int x_2 + \int u =$$

$$= -\iint y + 2\int y + \iint u + \int u$$