

Part 4,1 For the set of Equations (6) take 1st three Equations,
For 1st Equation, Let $t=0$.

$$\text{At } t=0 \quad u_i = a_i e^{b_i \cdot 0} = a_i \quad u_2 = a_2$$

multiply three Equations by $[d_2]$, $[d_1]$, and $[-1]$ respectively,

$$d_2 F_0 = a_1 d_2 + a_2 d_2$$

$$d_1 F_1 = a_1 u_1 d_1 + a_2 u_2 d_1$$

$$(-1) F_2 = -a_1 u_1^2 - a_2 u_2^2$$

$$-F_2 + d_1 F_1 + d_2 F_2 = -a_1 (u_1^2 - d_1 u_1 - d_2) - a_2 (u_2^2 - d_1 u_2 - d_2) = 0$$

since $p(u_i) = 0$

$$-F_2 + d_1 F_1 + d_2 F_0 = 0$$

$$\boxed{d_1 F_1 + d_2 F_0 = F_2}$$

Now taking 2nd, 3rd, 4th Equations (6)

$$d_2 F_1 = a_1 d_2 + a_2 d_2$$

$$d_1 F_2 = a_1 u_1 d_1 + a_2 u_2 d_1$$

$$(-1) F_3 = a_1 u_1^2 - a_2 u_2^2$$

$$-F_3 + d_1 F_2 + d_2 F_1 = -a_1 (u_1^2 - d_1 u_1 - d_2) - a_2 (u_2^2 - d_1 u_2 - d_2) = 0$$

$$\boxed{d_1 F_2 + d_2 F_1 = F_3}$$