$$\dot{VI} \Rightarrow 2\dot{a}\ell\cos\theta_1\cos\theta_2\sin\theta_2 \cdot$$
$$-2(a+r)\ell\dot{\theta}_1\sin\theta_1\cos\theta_2\sin\theta_2 \cdot$$
$$-2(a+r)\ell\dot{\theta}_2\cos\theta_1\sin\theta_2^2 \cdot$$
$$+2(a+r)\ell\dot{\theta}_2\cos\theta_1\cos\theta_2^2 \cdot$$

$\Rightarrow$

let $x = I + II + III + IV + V + VI$

$$\sqrt{x} = x^{\frac{1}{2}}$$

$$\frac{d}{dt}(x^{\frac{1}{2}}) = \frac{1}{2}x^{-\frac{1}{2}}\dot{x}$$

$$= \frac{\dot{x}}{2\sqrt{x}}$$

$$\dot{B} = \dot{\theta}_2\ell\cos\theta_2 - \frac{\dot{x}}{2\sqrt{x}} + \#\dot{3} + \#\dot{4} \quad \text{(root 1)}$$

$$\dot{B} = \dot{\theta}_2\ell\cos\theta_2 + \frac{\dot{x}}{2\sqrt{x}} + \#\dot{3} + \#\dot{4} \quad \text{(root 2)}$$