

$$\vec{r} = A_1 t \vec{i} + (A_2 t - A_3 t^2) \vec{j}$$

$$\vec{v} = A_1 \vec{i} + (A_2 - 2A_3 t) \vec{j}$$

$$|\vec{v}| = \sqrt{(A_1)^2 + (A_2 - 2A_3 t)^2}$$

$$\vec{a} = (A_1 \vec{i} + (A_2 - 2A_3 t) \vec{j})' = -2A_3 \vec{j}$$