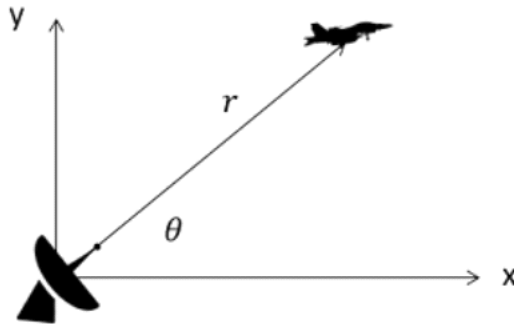


Question 1:

A radar tracking station gives the following raw to a user at a given point in time. Based on this data, what is the current velocity and acceleration in the r and θ directions? What is the current velocity and acceleration in the x and y directions?

$$\begin{array}{ll} \theta = 40^\circ & r = 6400 \text{ ft} \\ \dot{\theta} = -.039 \text{ rad/s} & \dot{r} = 312 \text{ ft/s} \\ \ddot{\theta} = .003807 \text{ rad/s}^2 & \ddot{r} = 9.751 \text{ ft/s}^2 \end{array}$$



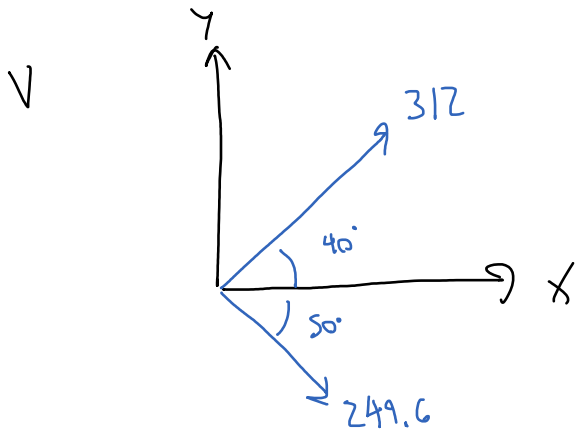
$$V = \dot{r} \hat{U}_r + r \dot{\theta} \hat{U}_\theta = 312 \hat{U}_r + (6400)(-.039) \hat{U}_\theta$$

$$\boxed{\begin{array}{l} V_r = 312 \text{ ft/s} \\ V_\theta = -249.6 \text{ ft/s} \end{array}}$$

$$a = (\ddot{r} - r \dot{\theta}^2) \hat{U}_r + (r \ddot{\theta} + 2 \dot{r} \dot{\theta}) \hat{U}_\theta =$$

$$((9.751) - (6400)(-.039)^2) \hat{U}_r + ((.003807)(6400) + (2)(312)(-.039)) \hat{U}_\theta$$

$$\boxed{\begin{array}{l} a_r = .0166 \text{ ft/s}^2 \\ a_\theta = .0288 \text{ ft/s}^2 \end{array}}$$

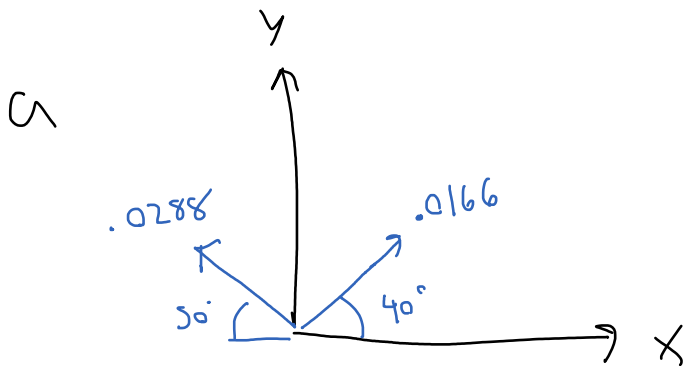


$$V_x = 312 \cos(40) + 249.6 \cos(50)$$

$$\boxed{V_x = 399.4 \text{ ft/s}}$$

$$V_y = 312 \sin(40) - 249.6 \sin(50)$$

$$\boxed{V_y = 9.35 \text{ ft/s}}$$



$$a_x = .0166 \cos(40) - .0288 \cos(50)$$

$$\boxed{a_x = -.0058 \text{ ft/s}^2}$$

$$a_y = .0166 \sin(40) + .0288 \sin(50)$$

$$\boxed{a_y = .0327 \text{ ft/s}^2}$$