44. A destroyer is hunting a submarine in a dense fog. The fog lifts for a moment, disclosing that the submarine lies on the surface 4 miles away. The submarine immediately descends and departs in a straight line in an unknown direction. The speed of the destroyer is three times that of the submarine. What path should the destroyer follow to be certain of intercepting the submarine? *Hint:* Establish a polar coordinate system with the origin located at the point where the submarine was sighted. Look up the formula for arc length in polar coordinates.

Arc Length of $r = r(\theta)$ for $\theta \in [\alpha, \beta]$

$$\int_{\alpha}^{\beta} \sqrt{(r(\theta))^2 + (r'(\theta))^2}\, d\theta$$