

1. Find the equation of the tangent line to the following curve when  $t = \sqrt{2}$

$$x(t) = \sin^{-1}\left(\frac{t}{2}\right), \quad y(t) = \tan^{-1}\left(\frac{t}{\sqrt{2}}\right)$$

2. Find the length of the curve

$$x(t) = \frac{1}{2}(e^t + e^{-t}), \quad y(t) = t, \quad -1 \leq t \leq 1.$$

3. Use integration, in polar coordinates, to compute the area of the region that is inside **one leaf** of the curve  $r = \sin(3\theta)$ .