1. Find the exact length of the curve

$$36y^2 = \left(x^2 - 4\right)^3, \qquad\qquad 2 \le x \le 3, \qquad\qquad y \ge 0.$$

2. Consider the cycloid

$$x = r(\theta - \sin\theta), \qquad\qquad y = r(1 - \cos\theta).$$

Find the slope of the tangent line to the cycloid at the point where $\theta = \frac{\pi}{3}$.