Long-Term Behavior

You are encouraged to share ideas and work together to understand the problems and their solutions. Each student, however, should write up their answers in their own words.

1. Find and classify (as stable, unstable, or semi-stable) all the equilibrium points of
   a. \( \frac{dy}{dt} = \cos(y) \)
   b. \( \frac{dy}{dt} = \sin(y) \)

2. Suppose \( \frac{dy}{dx} = x^2 - y^2 \), \( y(1) = 0 \). Explain how we can tell that \( 0 < y(x) < x \) for all \( x > 1 \). 
   *Hint*: sketch the slope field, specifically noting how the slope field looks along the lines \( y = x \) and \( y = 0 \). Explain why an integral curve can’t leave the wedge in the first quadrant formed by these two lines.