1. Show that the trigonometric equation

\[ \sin(\cos x) = \cos(\sin x) \]

has no solutions.

2. Prove that

\[ \frac{1}{\sin 45^\circ \sin 46^\circ} + \frac{1}{\sin 46^\circ \sin 47^\circ} + \cdots + \frac{1}{\sin 133^\circ \sin 134^\circ} = \frac{1}{\sin 1^\circ}. \]

3. Solve the following system of equations in real numbers:

\[ \frac{3x - y}{x - 3y} = x^2, \]
\[ \frac{3y - z}{y - 3z} = y^2, \]
\[ \frac{3z - x}{z - 3x} = z^2. \]

4. An ellipse, whose semi-axes have lengths \( a \) and \( b \), rolls without slipping on the curve \( y = c \sin \left( \frac{x}{a} \right) \). How are \( a, b, c \) related, given that the ellipse completes one revolution when it traverses one period of the curve?

5. Compute the indefinite integral

\[ \int \sqrt{\frac{1-x}{1+x}} \, dx, \quad x \in (-1, 1). \]