First part

- Given a line, a circle, and a point on the circle, the line is said to be *tangent to the circle at the point* if it intersects the circle at the point and nowhere else. Such a line is called a *tangent line* to the circle.
- Let S^1 refer to the circle in the Euclidean plane centered at the origin with radius 1.

Main question: Characterize all tangent lines to S^1.

- Specifically, any point on S^1 can be described in terms of an angle θ.[1] What is an equation describing the tangent line to S^1 at the point corresponding to θ?

[1] E.g. The right-most point of S^1 corresponds to $\theta = 0$, the top-most point of S^1 corresponds to $\theta = \pi/2$.

Second part

1. Characterize all matrices in row-echelon form with the following property: If any entry is changed, the matrix is no longer in row-echelon form.
2. Create a system of three linear equations in three variables whose solution set geometrically corresponds to:
   (a) The empty set
   (b) A point
   (c) A line
   (d) A plane
   (e) Euclidean 3-space.
3. In the example above whose solution set is a plane, describe the solution set in terms of a linear combination of vectors.