Break-Ground:

Standard form

Two young mathematicians discuss the standard form of a line.

Check out this dialogue between two calculus students (based on a true story):

Devyn: Riley, I think we've been too explicit with each other. We should try to be more implicit.

Riley: I. Um. Don't really...

Devyn: I mean when plotting things!

Riley: Okay, but I still have no idea what you are talking about.

Devyn: Remember when we first learned the equation of a line, and the "standard form" was

$$ax + by = c$$

or something, which is totally useless for graphing. Also a circle is

$$x^2 + y^2 = r^2$$

or something, and here y isn't even a function of x.

Riley: Ah, I'm starting to remember. We can write the same thing in two ways. For example, if you write

$$y = mx + b,$$

then y is **explicity** a function of x but if you write

$$ax + by = c,$$

then y is **implicitly** a function of x.

Devyn: What I'm trying to say is that we need to learn how to work with these "implicit" functions.

Problem 1 *Consider the unit circle*

$$x^2 + y^2 = 1.$$

The point $P = (0, 1)$ is on this circle. Reason geometrically to determine the slope of the line tangent to $x^2 + y^2 = 1$ at P.

Learning outcomes: Find the equation of the tangent line for curves that are not plots of functions.

Hint: *Draw a picture.*

The slope is $\boxed{0}$.

Problem 2 *Consider the unit circle*

$$x^2 + y^2 = 1.$$

The point

$$P = \left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2} \right)$$

is on this circle. Reason geometrically to determine the slope of the line tangent to $x^2 + y^2 = 1$ *at* P.

Hint: *Draw a picture.*

The slope is $\boxed{-1}$.