

9. [6 points]

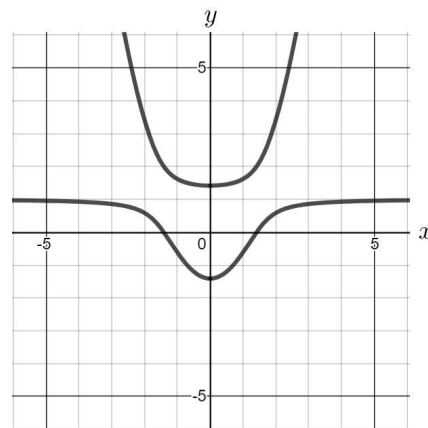
The implicit curve  $\mathcal{C}$  is given by the equation

$$y^2 - 1 = r^2 + x^2(y - r)$$

for some constant  $r$ . A graph of the curve with  $r = 1$  is shown to the right. Note that

$$\frac{dy}{dx} = \frac{2x(y - r)}{2y - x^2}.$$

Answer each of the following questions about the implicit curve  $\mathcal{C}$ . Your answers must be in **exact form**.



- a. [2 points] When  $r = 1$ , the curve  $\mathcal{C}$  passes through the point  $(\sqrt{2}, 0)$ . Write a formula for the tangent line to the curve  $\mathcal{C}$  at this point.

**Answer:** \_\_\_\_\_

- b. [4 points] In this part, we do not assume anything about  $r$ . In particular, do not assume  $r = 1$ . Find the  $(x, y)$  coordinates of **all** points at which the tangent line to the curve  $\mathcal{C}$  is horizontal. If there are no such points, write NONE. Your answer may be in terms of the constant  $r$ . You must show every step of your work.

**Answer:** \_\_\_\_\_