Problem statement A circle with center on the $y$-axis is tangent to the parabola $y = x^2$ at the points $(1,1)$ and $(-1,1)$. Find its center and radius. A diagram is shown to the right.

*Suggestion:* Find the equation of the normal line to $y = x^2$ at the point $(1,1)$, that is, the line that is perpendicular to the parabola (and circle) at $(1,1)$. How can this be used to find the circle’s center?