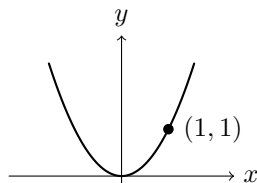


Question 2

Find the curvature of the parabola $\vec{r}(t) = \langle t, t^2 \rangle$ for general t , and evaluate it at the point $(1, 1)$. Where is the curvature largest?

Question 2 – Solution

Strategy Apply the planar curvature formula and then analyze its denominator.



Calculation With $x' = 1$, $y' = 2t$, $x'' = 0$, and $y'' = 2$,

$$\kappa(t) = \frac{|x'y'' - y'x''|}{(x'^2 + y'^2)^{3/2}} = \boxed{\frac{2}{(1 + 4t^2)^{3/2}}}.$$

At $t = 1$, $\boxed{\kappa = 2/(5\sqrt{5})}$.

Maximum The numerator is constant and the denominator is minimized at $t = 0$. Hence the maximum curvature is $\kappa(0) = 2$, at the vertex.