18.024 Homework 4 - Solutions

Problem 1.

The solutions of the two curves are \( y^2 = 4x \) and \( y^2 = 8 - 4x \).

Problem 2.

\[ a) \alpha(t) = \frac{\pi}{2} - 5t^2 \]
Note that \( \alpha(t) = \frac{\pi}{2} + 5t^2 \) is not a solution because the velocity never goes to the left of the \( y \)-axis.

\[ b) \mathbf{v}(t) = 5 \sin(5t^2) \hat{i} + 5 \cos(5t^2) \hat{j} \]

Problem 3.

\[ s = \sqrt{2}(1 - \exp(-2\pi M)) \]
So as \( M \) becomes arbitrarily large, the length of the curve converges to \( \sqrt{2} \).