Problem 1. (9 points) On the axes below, sketch the region bounded by the curves \( y = 2 - x \) and \( y = \frac{9}{4x + 5} \), and determine its area.

Problem 2. (7 points) For the region in problem 1, set up — but do not evaluate — an integral which calculates the volume of the solid formed by rotating the region about the line \( y = -1 \).
Problem 3. (9 points) This week, CNN reported that workers in Japan — accustomed to working 12-hour days most days of the week — are now being encouraged to go home early and spend time with their spouses. This is an attempt to raise the birth rate in Japan, which at 1.34 per thousand people is below the rate needed to sustain Japan’s population.

If Japan’s birth rate sees an increase of 0.5 per thousand per year due to this initiative, its population \( P \) in millions can be modeled by a function \( P(t) \), \( t \) measured in years, satisfying the initial-value problem

\[
P'(t) = (0.00134 + 0.0005t)P \quad \quad P(0) = 127.
\]

Find the solution of this IVP, and use it to predict what Japan’s population will be in five years.