1. Describe the idea behind Euler’s method in your own words.

**Solution:** The idea is to use the tangent line to the solution curve, whose slope we know from the differential equation itself, to approximate values of the solution near the initial point. This gives a \( y \)-value that may not actually be on the solution curve, but will be on *some* solution curve that just satisfies a different initial condition. We can iterate this procedure to estimate values of the solution that are farther away from the initial point.

2. Consider the ODE \( y' = 3 + t - y, \ y(0) = 1 \). Find an approximate value of \( y(1) \) using Euler’s method and \( h = 0.5 \).

**Solution:** \( y'(0) = 3 + 0 - 1 = 2 \), so our tangent line is given by \( y - 1 = 2(t - 0) \), or \( y = 2t + 1 \). At \( t = 0.5 \), this gives \( y = 2(0.5) + 1 = 2 \), so \( y'(0.5) = 3 + 0.5 - 2 = 1.5 \); the tangent line here is given by \( y - 2 = 1.5(t - 0.5) \), or \( y = 1.5t + 1.25 \). Finally, \( y(1) = 1.5(1) + 1.25 = 2.75 \) is our approximation.