

2.6 - A Numerical Method (Euler's Method)

2.6a

Recall the equation of the tangent line of the solution curve for the differential equation $y' = f(x, y)$, $y(x_0) = y_0$ is $y = y_0 + f(x_0, y_0)(x - x_0)$.

Definition: This is known as the **linearization of f at (x_0, y_0)** .

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

$$x_{n+1} = x_n + h$$

Example: Use Euler's method to obtain a four-decimal approximation of the indicated value. Carry out the recursion by hand, first using $h = 0.1$ and then using $h = 0.05$.

$$y' = x + y^2, \quad y(0) = 0; \quad y(0.2)$$
[illegible]

2.6b

Example: Use Euler's method to obtain a four-decimal approximation of the indicated value. First use $h = 0.1$ and then use $h = 0.05$. Find an explicit solution for each initial-value problem and then construct a table displaying estimated value, actual value, absolute error, and percentage relative error.

$$y' = 2xy, \quad y(1) = 1; \quad y(1.5)$$