Euler's Method

If given that $\frac{dy}{dx} = f(x, y)$ and

that the solution passes through

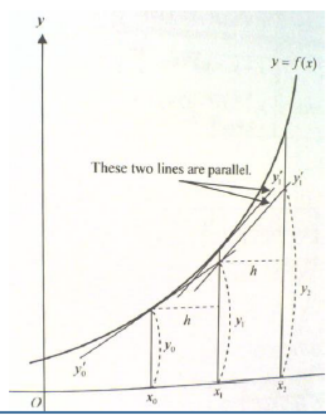
(x_0, y_0), then

$$x_{\text{new}} = x_{\text{old}} + \Delta x$$

$$y_{new} = y_{old} + \frac{dy}{dx}_{(x_{old}, y_{old})} \cdot \Delta x$$

BC Only: Euler's Method for Approximating the Solution of a Differential Equation

Euler's method uses a linear approximation with increments (steps), *h*, for approximating the solution to a given differential equation, $\frac{dy}{dx} = F(x, y)$, with a given initial value.



Process: Initial value (x_0, y_0)

$x_1 = x_0 + h$ $\quad$ $y_1 = y_0 + h \cdot F(x_0, y_0)$

$x_2 = x_1 + h$ $\quad$ $y_2 = y_1 + h \cdot F(x_1, y_1)$

$x_3 = x_2 + h$ $\quad$ $y_3 = y_2 + h \cdot F(x_2, y_2)$

. $\quad$.

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* This process repeats until the desired y – value is given.

Euler's Method:

Approximating the particular solution to: $y' = \frac{dy}{dx} = F(x,\ y)$

$x_n = x_{n-1} + h \qquad y_n = y_{n-1} + h \cdot F(x_{n-1},\ y_{n-1}) \qquad$ given: $h = \Delta x,\ (x_0,\ y_0)$