Eulers method

- Given step size for x (h)
- Given derivative $\left(\frac{dy}{dx}\right)$
- Given starting X $[x_0]$

Approximate

- y-value on a given function

X

$X + h = \text{new } X$

y-iteration

- use equation of tangent line

$y - f(x) = f'(x)(X - x)$

$y = f'(x)(X - x) + f(x)$

$y = f(x_y) + f'(x_y)h$

or

new y = old y + derivative (step size)

Ex

Use Eulers method with step size .3 to complete the approximate y-value $y(.9)$ of the solution of the initial valve problem $y' = x^2$ $y(0) = 1$

$h = .3$

$x_0 = 0$ $y_0 = 1$ $\frac{dy}{dx} = x^2$

$x_1 = .3$ $y_1 = 1 + .3(0)^2 = \boxed{1}$ $\boxed{(.3, 1)}$

$x_2 = .6$ $y_2 = 1 + .3((.3)^2) =$

$1 + .3(.09)$

$1 + .027 = 1.027$ $\boxed{(.6, 1.027)}$

$x_3 = .9$

$y_3 = 1.027 + .3((.6)^2)$

$1.027 + .3(.36)$

$1.027 + .108 = 1.135$

$\boxed{(.9, 1.135)}$