$\frac{dx}{dt} = xy - t + 2$, $\frac{dy}{dt} = \frac{3x}{y} + 5tx$, $x(1) = 2$, $y(1) = -3$

let $z_1 = x(t)$, $z_2 = y(t)$

$$z' = f(t, z) \text{ where } f(t, z) = \begin{bmatrix} z_1 z_2 - t + 2 \\ \frac{3 z_1}{z_2} + 5 t z_1 \end{bmatrix}$$

and the initial condition is $z(1) = \begin{bmatrix} 2 \\ -3 \end{bmatrix}$

According to Euler's method, $z^{(k+1)} = z^{(k)} + h^{(k)} f(t^{(k)}, z^{(k)})$

$$h = 0.05, \quad z_2 = z(1) + 0.05 \cdot \begin{bmatrix} 2(-3) - 1 + 2 \\ 3\frac{(2)}{-3} + 5 \cdot 1 \cdot 2 \end{bmatrix}$$

$$= \begin{bmatrix} 2 \\ -3 \end{bmatrix} + \begin{bmatrix} 0.05(-5) \\ 0.05(8) \end{bmatrix} = \begin{bmatrix} 1.75 \\ -2.6 \end{bmatrix}$$

$$z_3 = z(2) + 0.05 \begin{bmatrix} 1.75 \cdot (-2.6) - 2 + 2 \\ 3\frac{1.75}{-2.6} + 5(2)(1.75) \end{bmatrix}$$

$$= \begin{bmatrix} 1.75 \\ -2.6 \end{bmatrix} + 0.05 \begin{bmatrix} -4.55 \\ 15.48 \end{bmatrix}$$

$$= \begin{bmatrix} 1.5225 \\ -1.826 \end{bmatrix}$$