

Mathematics 172

Quiz 22

Name: _____

You must show your work to get full credit.

Let x and y be defined by the initial value problem

$$\begin{aligned}\frac{dx}{dt} &= .1x \left(\frac{10 - .2x - .3y}{10} \right) & x(0) &= 8 \\ \frac{dy}{dt} &= .2y \left(\frac{8 - .4x - .6y}{8} \right) & y(0) &= 10\end{aligned}$$

1. Compute $x'(0)$ and $y'(0)$.

$$x'(0) = \underline{\hspace{2cm}} \quad y'(0) = 0 \underline{\hspace{2cm}}$$

$$x'(0) = .1(8) \left(\frac{10 - .2(8) - .3(10)}{10} \right) = 0.054$$

$$y'(0) = .2(10) \left(\frac{8 - .4(8) - .6(10)}{8} \right) = -0.3$$

2. Estimate $x(0.5)$ and $y(0.5)$.

$$x(0.5) \approx \underline{8.027} \quad y(0.5) \approx \underline{9.85}$$

$$\begin{aligned}x(0.5) &\approx x(0) + x'(0)(.5) \\ &= 8 + (0.054)(.5) \\ &= 8.027\end{aligned}$$

$$\begin{aligned}y(0.5) &= y(0) + y'(0)(.5) \\ &= 10 + (-0.3)(.5) \\ &= 9.85\end{aligned}$$