Mathematics 172

Quiz 18 Name: Key

You must show your work to get full credit.

Consider a system of differential equations

$$\frac{dx}{dt} = .5x(10 - x - 2y)$$
$$\frac{dy}{dt} = .2y(30 - 6x - 5y)$$

1. If $x(4) = 1$ and $y(4) = 6$ what at $x'(4)$ and $y'(4)$? $x'(4) =$ -1.5

$x'(4) = .5(1)(10 - (1) - 2(6)) = -1.5$

$y'(4) = .2(6)(30 - 6(1) - 5(6)) = -7.2$ $y'(4) =$ -7.2

2. For the same equations assume we have solutions with $x(0) = 6$ and $y(0) = 1$
(a) What are $x'(0)$ and $y'(0)$? $x'(0) =$ 6

$x'(0) = .5(6)(10 - 6 - 2(1)) = 6$

$y'(0) = .2(1)(30 - 6(6) - 1) = -1.4$ $y'(0) =$ -1.4

(b) Is $x(t)$ initially increasing or decreasing? Write a sentence or two explaining your answer.

$x'(0) = 6$ is positive. A positive derivative implies increasing.

(c) Is $y(t)$ initially increasing or decreasing? Write a sentence or two explaining your answer.

$y'(0) = -1.4$ is negative. A negative derivative implies decreasing