Mathematics 172

Quiz 19 Name: Key

You must show your work to get full credit.

For the initial value problem

$$\frac{dx}{dt} = .1x(10 - x - 3y) \qquad x(0) = 2$$
$$\frac{dx}{dt} = .2y(15 - 2x - 4y) \qquad y(0) = 4$$

do two Euler steps of length .25 to estimate $x(.5)$ and $x(.5)$.

$x(.5) \approx$ 1.764

$y(.5) \approx$ 2.91

Step 1 $x'(0) = .1(2)(10-2-3(4)) = -.8$

$y'(0) = .2(4)(15-2(2)-4(4)) = -4$

$h = .25$

$x(.25) \approx x(0) + x'(0)h$
$= 2 + (-.8)(.25)$
$= 1.8$

$y(.25) \approx y(0) + y'(0)h$
$= 4 + (-4)(.25)$
$= 3$

Step 2 $x'(.25) \approx .1(1.8)(10 - 1.8 - 3(3))$
$= -.144$

$y'(.25) \approx .2(3)(15 - 2(1.8) - 4(3))$
$= -.36$

$x(.5) \approx x(.25) + x'(.25)(.25)$
$\approx 1.8 + (-.144)(.25)$
$= 1.764$

$y(.5) \approx y(.25) + y'(.25)(.25)$
$\approx 3 + (-.36)(.25)$
$= 2.91$