

Group 1 (Math 250A, 11/02/09)

Consider the ODE and initial condition

$$\frac{dy}{dx} = x\sqrt{y} \qquad y(1) = 4$$

- a. Use Euler's method with a step-size $\Delta x = 0.1$ to estimate $y(1.1), y(1.2), y(1.3), y(1.4), y(1.5)$.

- b. Do you think your estimated values will be exact, too big or too small? Explain.

- c. Can you extrapolate as to what qualitatively you think your solution will do for larger values of x ?

- d. Is your approximated solution going to be unique? Why or why not?

- e. Determine the exact solution and compare your estimated values.

Group 2 (Math 250A, 11/02/09)

Consider the ODE and initial condition

$$\frac{dy}{dx} = y \qquad y(0) = 1$$

- Use Euler's method to determine $y(1)$ using 1, 2, 4, 8 and 16 steps.
- What do you think you would get if you used 32 steps? 64 steps? 43 steps? [Don't compute these by hand!]
- Determine the exact solution. What famous # are you computing here?
- Based upon your numerical estimates, can you infer what $y(2)$ might be? $y(3)$? $y(c)$ (where c is some # greater than 1)? How does changing the effective step-size (i.e., the number of points computed between $y(0)$ and $y(c)$) affect your estimate?

Group 3 (Math 250A, 11/02/09)

The question below comes from Ch.3.3 in your ODE book (Lomen & Lovelock). In addition to the stated questions, also address the additional questions raised further below.

5. Figure 3.34 shows the slope field and a numerical solution — produced by Euler's method — for a particular initial value problem. These were generated by a computer software program. How do you know that the slope field and the numerical solution are not consistent? Which do you think is correct, the slope field or the numerical solution? What would you try to change in the software program to make them consistent?

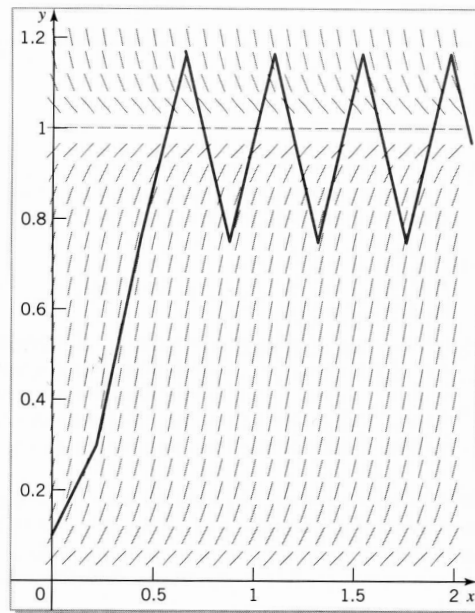


FIGURE 3.34 The slope field and a numerical solution

- What was the step-size used for the numerical approximation?
- Can you deduce a possible ODE consistent with the figure shown?
- How might you modify the ODE such that the used step-size wouldn't be so problematic?