Math 10B. Lecture Examples.

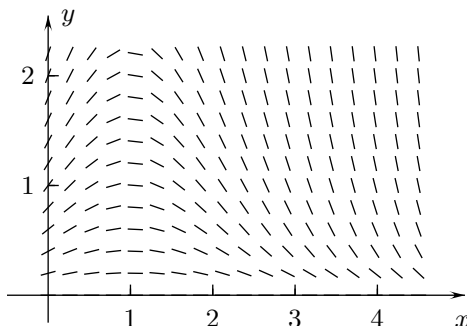## Section 11.3. Euler's method†

Example 1   Figure 1 shows the slope field for the differential equation,

$$\frac{dy}{dx} = (1-x)y.$$

Draw the graph of approximate solution $y = y_E(x)$ for $0 \leq x \leq 4$ with the initial value $y(0) = 1$ that is obtained by Euler's method with the partition, $0 < 1 < 2 < 3 < 4$.

Slope field for
$$\frac{dy}{dx} = (1-x)y$$

FIGURE 1

Answer: Figure A1a ● (Figure A1b shows the graph of the exact solution $y = y(x)$ with the Euler approximation.)
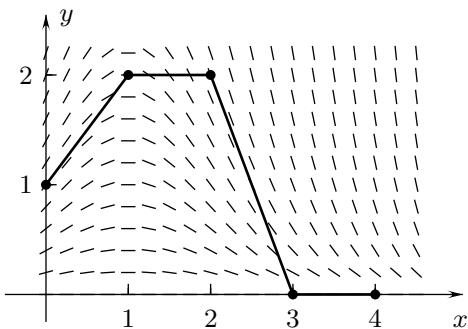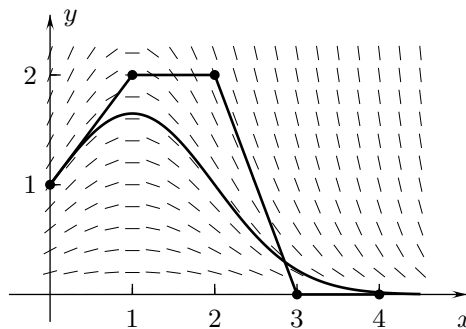

Figure A1a

Figure A1b

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†Lecture notes to accompany Section 11.3 of *Calculus* by Hughes-Hallett et al.

Example 2   Use Euler's method with four subintervals to find the values at the partition points of

an approximate solution of $\dfrac{dy}{dx} = \dfrac{(1-x)y}{x}$, $y(1) = 3$, $1 \le x \le 5$. Then draw its graph

         Answer: $y_E(1) = 3$ • $y_E(2) = 1.5$ • $y_E(4) = 0.5$ • $y_E(5) = 0.125$ • Figure A2

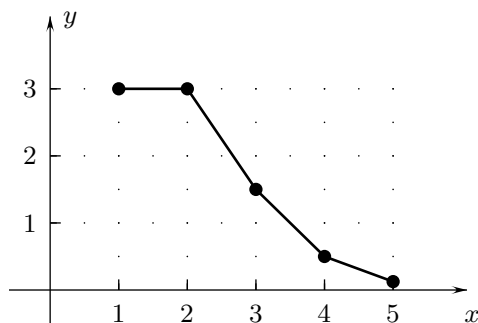Figure A2

Interactive Examples

Work the following Interactive Examples on Shenk's web page, http//www.math.ucsd.edu/˜ashenk/:[‡]

     Section 9.4: Example 1

[‡]The chapter and section numbers on Shenk's web site refer to his calculus manuscript and not to the chapters and sections of the textbook for the course.