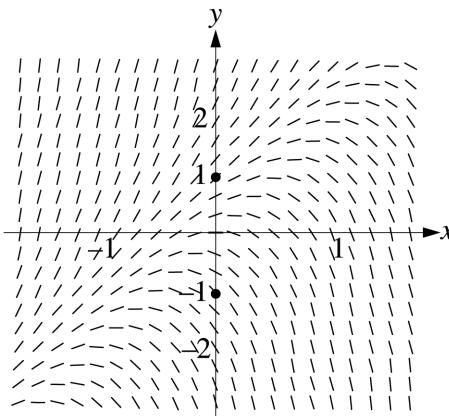


## 2002 AP® CALCULUS BC FREE-RESPONSE QUESTIONS

5. Consider the differential equation  $\frac{dy}{dx} = 2y - 4x$ .

(a) The slope field for the given differential equation is provided. Sketch the solution curve that passes through the point  $(0, 1)$  and sketch the solution curve that passes through the point  $(0, -1)$ .

**(Note: Use the slope field provided in the pink test booklet.)**



- (b) Let  $f$  be the function that satisfies the given differential equation with the initial condition  $f(0) = 1$ . Use Euler's method, starting at  $x = 0$  with a step size of 0.1, to approximate  $f(0.2)$ . Show the work that leads to your answer.
- (c) Find the value of  $b$  for which  $y = 2x + b$  is a solution to the given differential equation. Justify your answer.
- (d) Let  $g$  be the function that satisfies the given differential equation with the initial condition  $g(0) = 0$ . Does the graph of  $g$  have a local extremum at the point  $(0, 0)$ ? If so, is the point a local maximum or a local minimum? Justify your answer.

6. The Maclaurin series for the function  $f$  is given by

$$f(x) = \sum_{n=0}^{\infty} \frac{(2x)^{n+1}}{n+1} = 2x + \frac{4x^2}{2} + \frac{8x^3}{3} + \frac{16x^4}{4} + \cdots + \frac{(2x)^{n+1}}{n+1} + \cdots$$

on its interval of convergence.

- (a) Find the interval of convergence of the Maclaurin series for  $f$ . Justify your answer.
- (b) Find the first four terms and the general term for the Maclaurin series for  $f'(x)$ .
- (c) Use the Maclaurin series you found in part (b) to find the value of  $f'\left(-\frac{1}{3}\right)$ .

**END OF EXAMINATION**