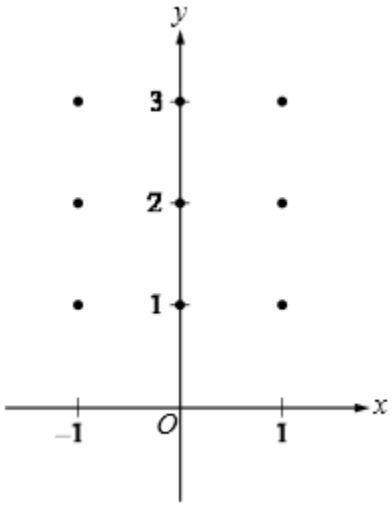
BC Calculus

Review #5 – Slope Fields and Euler's Method

1998 BC4 (calculator allowed)

Consider the differential equation given by $\frac{dy}{dx} = \frac{xy}{2}$.

a) On the axes below, sketch a slope field for the given differential equation at the nine points indicated.

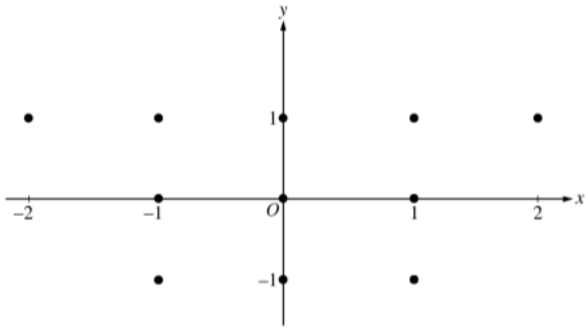



b) Let $y = f(x)$ be the particular solution to the given differential equation with the initial condition $f(0) = 3$. Use Euler's method starting at $x = 0$ with step size of *0.1* to approximate $f(0.2)$. Show the work that leads to your answer.

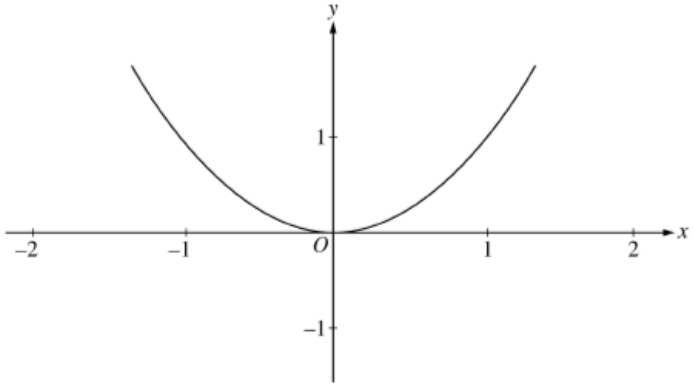
c) Find the particular solution $y = f(x)$ to the given differential equation with the initial condition $f(0) = 3$. Use your solution to find $f(0.2)$.

Consider the differential equation given by $\frac{dy}{dx} = x(y-1)^2$.

a) On the axes provided, sketch a slope field for the given differential equation at the eleven points indicated.




b) Use the slope field for the given differential equation to explain why a solution could not have the graph shown below.



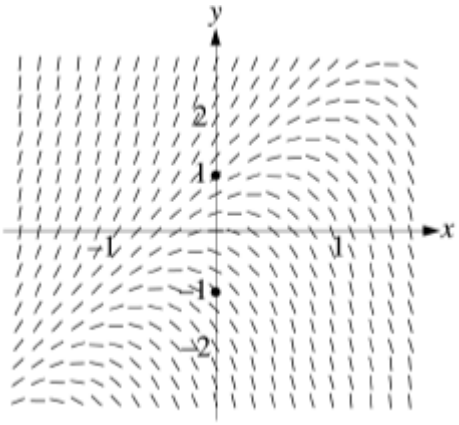

c) Find the particular solution $y = f(x)$ to the given differential equation with the initial condition $f(0) = -1$.

d) Find the range of the solution found in part c).

2002 BC5 (no calculator)

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

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




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 step size of *0.1*, to approximate $f(0.2)$. Show the work that leads to your answer.

b) 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.