Euler's Method of Approximation

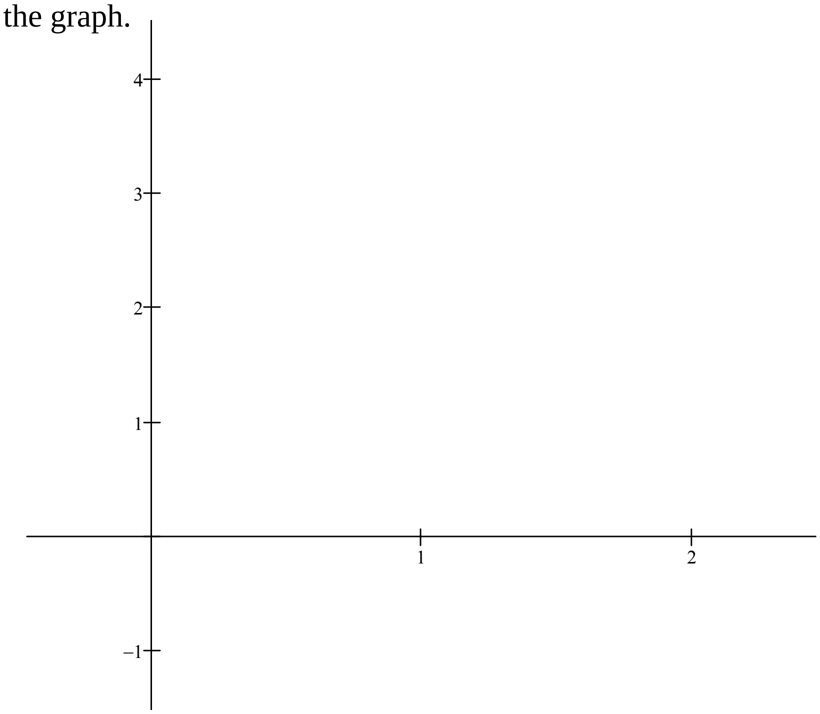
A simplified version of Euler's method works like this:

Starting with the difference quotient approximation:

$f'(x) \approx \frac{f(x+h) - f(x)}{h}$ where h is very close to 0. Multiplying both sides by h and adding $f(x)$ to both sides yields $f(x+h) \approx f(x) + f'(x)h$

1) Using this formula approximate the graph of y for the given differential equation.
$y' = x - y$, $y(0) = 1$ from x = 0 to x = 2 using h = .2. Record your results in the table and plot the approximation on the graph.

x	y



Separable Equations

An example of a separable differential equation would be $y' = y$. This can be solved by rewriting the equation as

$\frac{dy}{dx} = y$ and separating the x's and the y's putting each on one side of the equation. By doing so, we get

$\frac{dy}{y} = dx$. Integrating both sides gives us

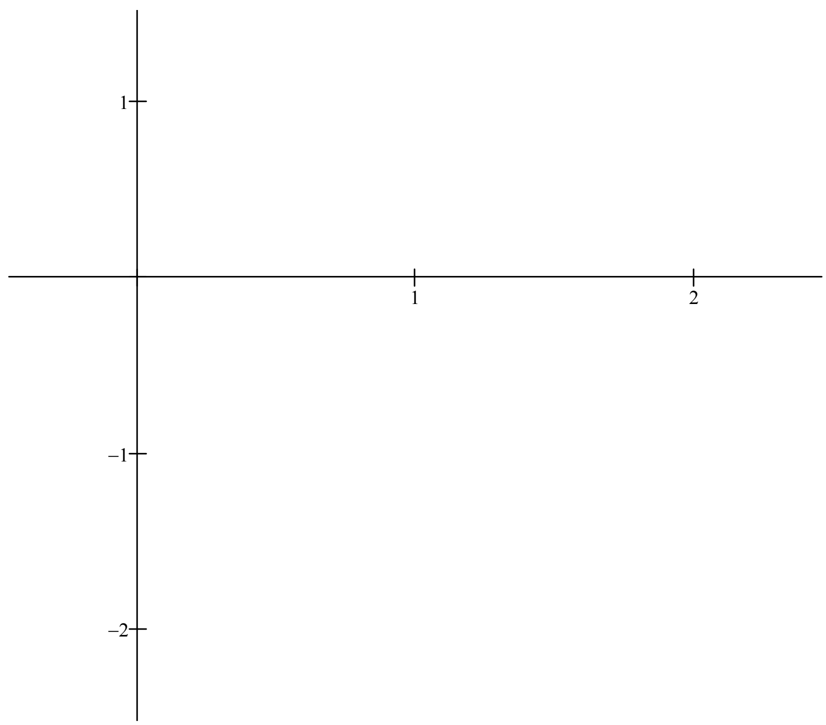
$\ln y = x + C$ and solving for y gives us

$y = e^{x+c}$ or just $y = Ce^x$

Approximate the graphs of y for the given differential equations. Show your calculations. Then use separation of variables to solve for y.

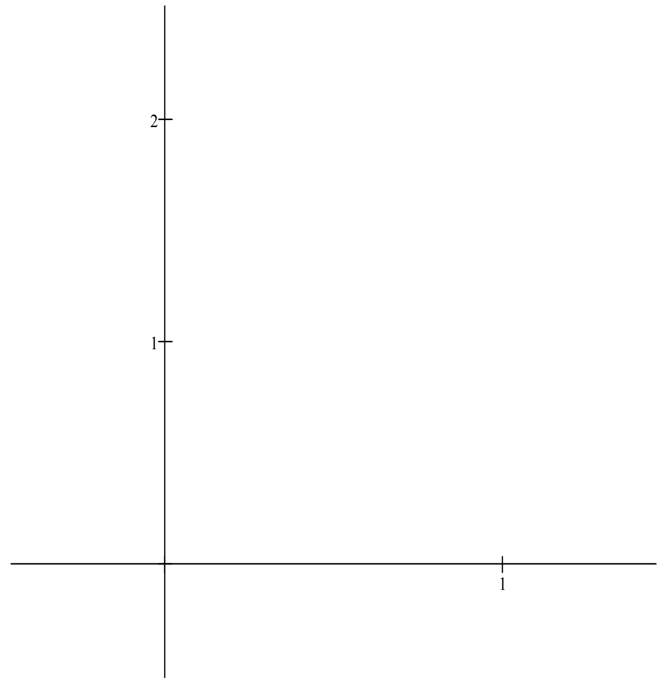
2) $y' = y^2$ $y(1) = -1$ $h = .2$ over the interval [1, 2]

x	y



3) $y' = 1 + y$ $\quad y(0) = 0$ $\quad h = .1$ $\quad$ over the interval [0, 0.5]

x	y



4) $y' = 2x - 2xy$ $y(0) = 3$ $h = .1$ over the interval [0, 0.5]

x	y