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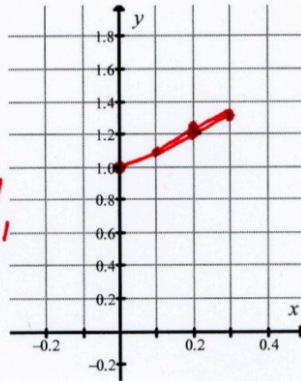
BC Topic 18 - Euler's Method

due Friday, April 12

Euler's Method This is a more precise method of graphing an approximate solution to a differential equation.

Example 8. Use Euler's method to construct an approximate solution for the differential equation $\frac{dy}{dx} = y$. Start at the point (0,1) and use step size $\Delta x = .1$

x	y	$\frac{dy}{dx} = y$	$\Delta y = (\text{slope}) \Delta x$
0	1	1	$\Delta y = 1(.1) = .1$
.1	1.1	1.1	$\Delta y = 1.1(.1) = .11$
.2	1.21	1.21	$\Delta y = 1.21(.1) = .121$
.3	1.331		



Example 9. Solve $\frac{dy}{dx} = y$ algebraically. Fill in the table with the actual values of y .

$$\frac{1}{y} dy = dx$$

$$\ln|y| = x + C,$$

$$y = Ce^x$$

$$1 = Ce^0$$

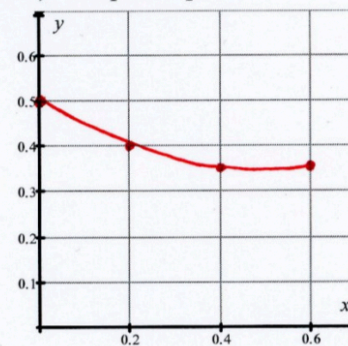
$$1 = C$$

$$y = e^x$$

x	y
0	1
.1	1.105
.2	1.221
.3	1.350

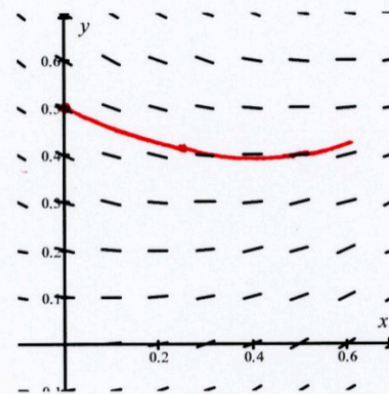
Example 10. Use Euler's Method to approximate the particular solution of the diff. eq. $y' = x - y$ passing through the point (0,0.5). Let $\Delta x = .2$ and do three steps ($n = 3$). Graph the points.

x	y	$\frac{dy}{dx} = x - y$	$\Delta y = (\text{slope}) \Delta x$
0	.5	-.5	$\Delta y = (-.5)(.2) = -.1$
.2	.4	-.2	$\Delta y = (-.2)(.2) = -.04$
.4	.36	.04	$\Delta y = (.04)(.2) = .008$
.6	.368		



Example 11. Sketch a particular solution of the diff. eq. $y' = x - y$ passing through the point (0,0.5) using the slope field given. Do the two graphs coincide?

yes (approx.)



13. **Without using a calculator**, use Euler's Method with a step size of 0.1 to approximate $f(0.3)$ if $f(0) = 3$ and $f'(x) = x + y$.
14. **Without using a calculator**, use Euler's Method with 3 steps each with a size of $\frac{1}{2}$ to approximate a y -value if $y(0) = 2$ and $y' = 2x - 3y$.
15. **Using a calculator**, if $y(1) = 2$ and $y' = e^{xy}$ use 4 steps of Euler's Method to approximate $y(0.8)$.

13. $f(0.3) \approx 4.024$	14. $y\left(\frac{3}{2}\right) \approx \frac{1}{2}$	15. $y(0.8) \approx 1.078$ or 1.079
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