MTHSC 208, Summer II, 2010

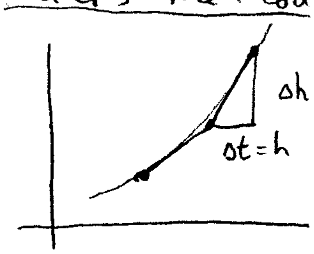
Week 1 summary:

- In many real-world situations, there are simple relations between a function and its derivatives. These can be expressed as <u>differential equations</u>.
- <u>Exponential growth</u> : $y' = ky$

  <u>Exponential decay</u>: $y' = -ky$

  <u>Decay → value</u> $y' = k(A-y)$
- <u>Slope fields</u>: a way to "visualize" all solutions to an ODE. We can sketch a slope field using <u>isoclines</u> (not in textbook!)

  Set $y' = \text{const.}$, plot the resulting line/curve.
- Plotting solutions to autonomous ODE's (y' doesn't depend on t)
- <u>Euler's method</u>: $y' = f(t,y)$.



  Given (t_0, y_0) & stepsize h (i.e., $y(t_0) = y_0$)

  <u>Method</u>: $(t_{k+1}, y_{k+1}) = (t_k + \underbrace{h}_{\Delta t}, y_k + \underbrace{h \cdot f(t_k, y_k)}_{\Delta y})$
- Solving ODEs by <u>separation of variables</u>.
- Difference between <u>general solution</u> & a <u>particular sol'n</u> (initial conds.)
- Another situation modeled by decay → value ODE: Falling objects with air resistance
- <u>Linear ODE's</u>: $y'(t) = a(t)\,y(t) + f(t)$. <u>Homogeneous</u> if $f(t) = 0$.