Excercise

- Write down the main topic/title of the first five classes
- For each class, what were the main ideas
  - Outline each class.
  - Put in details
  - What examples were done?
- Do this alone, then with a group, then switch groups.
- Create your own review notes (like these slides).
  - First "recall" then look up to fill in.

Class 1: intro, basics, moving, formatting

Topic
Course Intro. Excel basics, organization
Arrays, fill, locked cells, plotting
Solving nonlinear equations
Curve fitting
Rate equations
Review, Midterm 1

- Select: ctrl+arrow; double click cell, ctrl+shift+arrow
- Copy/paste: right click; ctrl+c, ctrl+v; copy, highlight, paste; fill
  - Paste special
- Insert, delete, clear contents.
- Right click → format cells
- Bold, color, indent, borders, merge, resize, font
  - Use single tick to enter equations as text: '=sin(x) → =sin(x) appears
- Organization
  - Variable, value, units.
  - Whitespace

Class 2: functions, arrays, fill, plotting

Topic
Course Intro. Excel basics, organization
Arrays, fill, locked cells, plotting
Solving nonlinear equations
Curve fitting
Rate equations
Review, Midterm 1

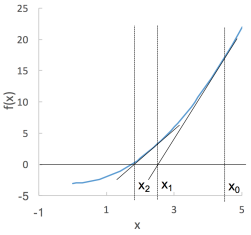
- Functions
  - abs, cos, sin, tanh, int, ln, log10, sum, sqrt
  - count, max, min, average, stdev
  - if, countif, today, now
  - sumsq
- Name cells
- Fill
  - Horizontal
  - Vertical
  - Lock cells (A1): F4, cmd+t
- Plotting
  - Highlight → scatter plot.
  - Right click, double click, menu options.
  - Make it readable; include axis labels (units), legend, font size.
  - Multiple lines
    - Highlight several columns
    - Copy one plot onto another
    - Right click → select data…
    - "fill" selected column data → drag
- Get external data

Class 3: nonlinear equations

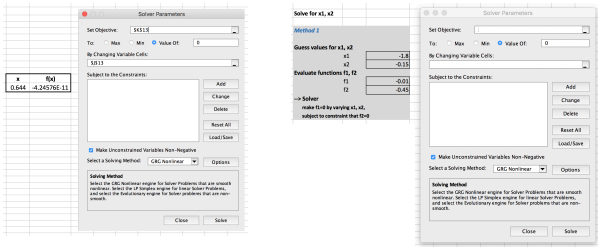
Topic
Course Intro. Excel basics, organization
Arrays, fill, locked cells, plotting
Solving nonlinear equations
Curve fitting
Rate equations
Review, Midterm 1

- Nonlinear equations
  - F(x)=0 form.
  - Newton's method

$$x_{i+1} = x_i - \frac{f(x_i)}{f'(x_i)}$$



  - Solver
    - Cell for x, cell for f(x)
    - 1 equation
    - 2+ equations



Class 4: curve fitting

Topic
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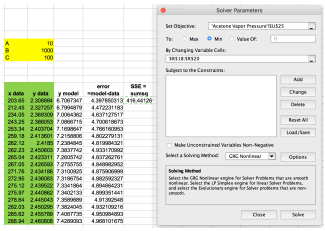
Solving nonlinear equations
Curve fitting
Rate equations
Review, Midterm 1

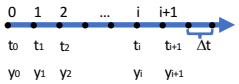
- Trendlines
  - Plot the data
  - Right click → add trendline
  - Select type
    - If type doesn't fit:
      - Redefine variables: regroup;
      - "massage" the formula
  - Options
    - R^2, display equation, set intercept
- General fitting
  - If trendline doesn't work, or if desired
  - Model equation with parameters
    - Find best fitting parameters
  - Cells for parameters
  - Cells for x, y data
  - Cells for y model
    - in terms of parameters
  - Error = model-data
  - Find $SSE = \sum_i E_i^2$



Class 5: rate equations

Topic
Course Intro. Excel basics, organization
Arrays, fill, locked cells, plotting
Solving nonlinear equations
Curve fitting
Rate equations
Review, Midterm 1

- Given the slope f(y,t)
- Find function y(t)
- Do this numerically
- Explicit Euler
  - Discrete grid of points



$$\frac{dy}{dt} = f(y,t)$$

$$\frac{\Delta y}{\Delta t} = f(y,t)$$

$$\frac{y_{i+1} - y_i}{\Delta t} = f(y_i, t_i) \rightarrow y_{i+1} = y_i + \Delta t f(y_i, t_i)$$

  - Start at y_0, step to y_1 → Start at y_1, step to y_2 → Etc.
  - Choose a stable (small) timestep size
- Write cells for constants: dt, y_0, etc.
- Write t-grid and y solution in terms of "constants" cells
- Fill down → plot answer

$$\frac{dy}{dt} = f(y,t)$$
$$y(0) = y_0$$