MATH 3341: Introduction to Scientific Computing Lab

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Lab 10: MATLAB 3D Plots

mesh and surf

meshgrid Cartesian grid in 2-D/3-D space

- `[X, Y] = meshgrid(x,y)`: replicates the grid vectors `x` and `y` to produce the coordinates of a rectangular grid `(X, Y)`. The grid vector `x` is replicated `numel(y)` times to form the columns of `X`. The grid vector `y` is replicated `numel(x)` times to form the rows of `Y`.
- Example:

```
x = [1, 3, 5];
y = [2; 4];
[X, Y] = meshgrid(x, y)
```

$$x = \begin{bmatrix} 1 & 3 & 5 \end{bmatrix}, y = \begin{bmatrix} 2 \\ 4 \end{bmatrix}, X = \begin{bmatrix} 1 & 3 & 5 \\ 1 & 3 & 5 \end{bmatrix}, Y = \begin{bmatrix} 2 & 2 & 2 \\ 4 & 4 & 4 \end{bmatrix}.$$

mesh and surf: 3-D mesh (wireframe) / surface.

- `mesh(X,Y,Z)`: plots the colored parametric mesh (wireframe) defined by four matrix arguments.
- `mesh(Z)`: same as `[X, Y] = meshgrid(1:size(Z,2), 1:size(Z,1)); mesh(X, Y, Z)`.
- `surf(X,Y,Z)`: plots the colored parametric surface defined by four matrix arguments.
- `surf(Z)`: same as `[X, Y] = meshgrid(1:size(Z,2), 1:size(Z,1)); surf(X, Y, Z)`.
- `surfc(...)` is the same as `surf(...)` except that a contour plot is drawn beneath the surface.

colormap Color look-up table

- `colormap(map)` sets the current figure's colormap to map.
- Built-in colormaps: `parula`, `jet`, `hsv`, `hot`, `cool`, `sprint`, `summer`, `autumn`, `winter`, `gray`, `bone`, `copper`, `pink`, `lines`, `colorcube`, `prism`, `flag`, `white`.

Animations

- `drawnow`: Update figure windows
- `comet(x, y)`: Comet-like trajectory plot of vector `y` vs. `x`
- `h = animatedline(x,y)`: creates an animated line with initial data points defined by `x` and `y`.
- `addpoints(h,x,y)`: add points `(x, y)` to animated line `h`.