

MATH 3341: Introduction to Scientific Computing Lab

Melissa Butler

University of Wyoming

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The background of the slide features a large, faint watermark of the University of Wyoming seal. The seal is circular with a rope-like border. Inside the border, the words "UNIVERSITY OF WYOMING" are at the top, "EQUALITY" is in the center, and "1886" is at the bottom. There is also a small illustration of a mountain and a river within the seal.

Lab 10: MATLAB 3D Plots



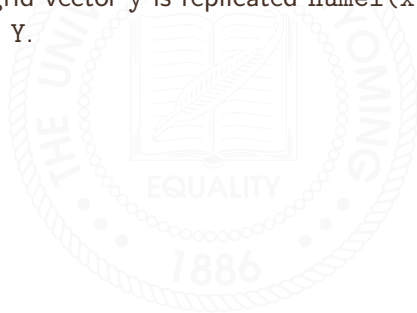
The background of the slide features a large, faint watermark of the University of Wyoming seal. The seal is circular with a rope-like border. Inside the border, the words "UNIVERSITY OF WYOMING" are at the top, "EQUALITY" is at the bottom, and "1886" is at the very bottom. In the center of the seal is an open book.

mesh and surf



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

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



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- Example:

```
x = [1, 3, 5];
```

```
y = [2; 4];
```

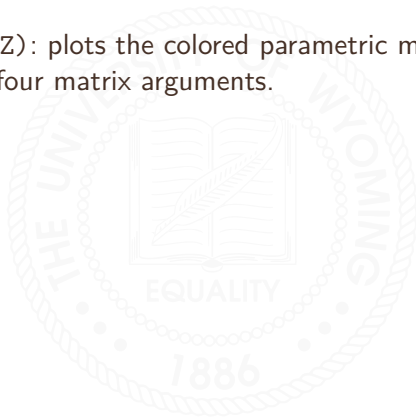
```
[X, Y] = meshgrid(x, y)
```

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



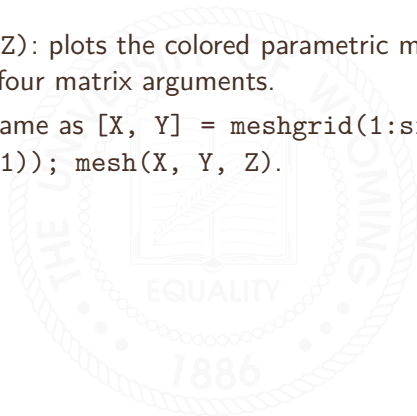
mesh and surf: 3-D mesh (wireframe) / surface.

- `mesh(X,Y,Z)`: plots the colored parametric mesh (wireframe) defined by four matrix arguments.



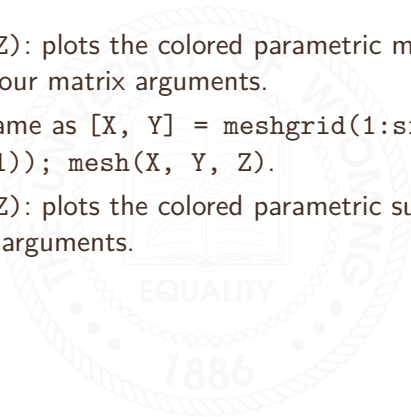
mesh and surf: 3-D mesh (wireframe) / surface.

- `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)`.



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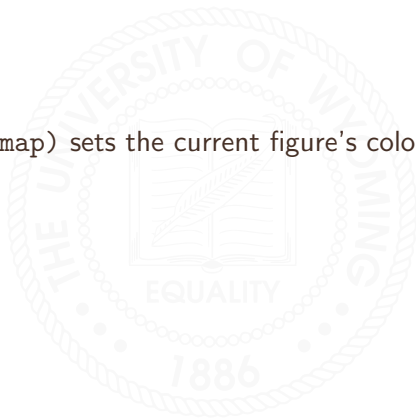
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- `surf(X,Y,Z)`: plots the colored parametric surface defined by four matrix arguments.
- `surf(Z)`: same as `[X, Y] = meshgrid(1:size(Z,2), 1:size(Z,1)); surf(X, Y, Z)`.
- `surfc(...)` is the same as `surf(...)` except that a contour plot is drawn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



colormap Color look-up table

- `colormap(map)` sets the current figure's colormap to `map`.



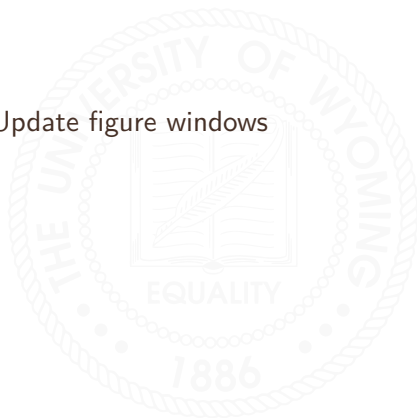
colormap Color look-up table

- `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`.



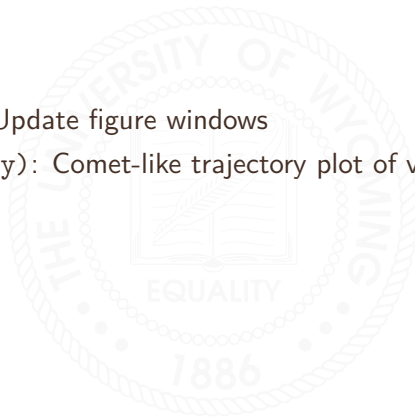
Animations

- `drawnow`: Update figure windows



Animations

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- `comet(x, y)`: Comet-like trajectory plot of vector y vs. x



Animations

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- `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 .



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 .

