

# MATH 3341: Introduction to Scientific Computing Lab

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The background features a large, faint watermark of the University of Wyoming seal. The seal is circular with a rope-like border. Inside the border, the text "UNIVERSITY OF WY" is at the top, "EQUALITY" is in the middle, and "1886" is at the bottom. In the center of the seal is a stylized figure of a cowboy on a horse.

## Lab 10: MATLAB 3D Plots



The background features a large, faint watermark of the University of Wyoming seal. The seal is circular with a rope-like border. Inside the border, the text "UNIVERSITY OF WYOMING" is 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 with a quill pen resting on it.

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  $Y$ .
- Example:

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

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

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

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



# 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  $h$ .

