

# MATH 3341: Introduction to Scientific Computing Lab

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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



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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)
```

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



## 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  $h$ .

