# Define central, forward, and backward difference here to approximate derivatives later on

Define central difference function

# Parts a and b

Read altitude.txt and save in variable called data

# Find positional values

Start at 0, stepping by 30,000, stop when reach number of data points and save to position variable

# Find x-slope

Use central difference method to find slope in middle row points, save to variable x\_slope’s middle rows

# Find y-slope

# Depending on how y\_slope is set up, may store to rows instead of columns?

Use central difference method to find slope in middle column points, save to variable y\_slope’s middle columns

# Find intensity at each point

phi = 45 # angle of light in degrees

Create intensity vector a

Create gradient vector v from x\_slope, y\_slope and negative 1

Dot product intensity vector a and gradient vector, store in variable dotted

Divide dotted by the magnitude of the gradient vector to get illumination

# Plot result in 3-D

Plot illumination with good color map—grey??

# Label graph

Add appropriate title to graph

Add appropriate x-label to graph

Add appropriate y-label to graph

Show graph

# Part c

read stm.txt to data

# Find positional values

Start at 0, stepping by 2.5, stop when reach number of data points and save to position variable

# Find x-slope

Use central difference method to find slope in middle row points, save to variable x\_slope’s middle rows

Use forward difference to find first row’s slope, save to variable x\_slope’s first row

Use backward difference to find last row’s slope, save to variable x\_slope’s last row

# Find y-slope

# Depending on how y\_slope is set up, may store to rows instead of columns?

Use central difference method to find slope in middle column points, save to variable y\_slope’s middle columns

Use forward difference to find first column’s slope, save to variable y\_slope’s first columns

Use backward difference to find last column’s slope, save to variable y\_slope’s last columns

# Find intensity at each point

phi = 45 # angle of light in degrees

Create intensity vector a

Create gradient vector v from x\_slope, y\_slope and negative 1

Dot product intensity vector a and gradient vector, store in variable dotted

Divide dotted by the magnitude of the gradient vector to get illumination

# Plot result in 3-D

Plot illumination with good color map—grey??

# Label graph

Add appropriate title to graph

Add appropriate x-label to graph

Add appropriate y-label to graph

Show graph