Name:_____

GIS in Water Resources Midterm Exam **Fall 2016**

There are three questions on this exam. Please do all three. They are not all of equal weight.

Question 1.

(a) Three key functions of GIS are Visualization, Data Storage, and Analysis. For ArcGIS Pro, briefly describe the components taht achieve these functions:

Visualization

Data Storage

Analysis

(b) Two key datasets that we have used in this class are NHDPlus and the National Elevation Dataset. Briefly outline what each of these datasets describes and what data type (vector or raster) is used to represent it.

NHDPlus

National Elevation Dataset

(c) Define and give an example of the terms “spheroid” and “earth datum”. Explain the difference between them

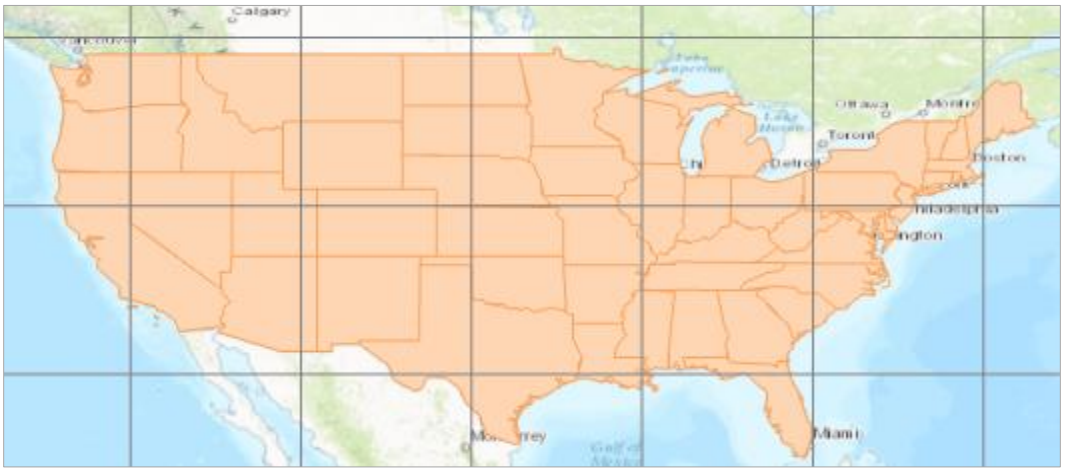
Spheroid

Earth Datum

Difference

Question 2.

The map below shows the continental United States in geographic coordinates overlaid by a grid which has 10° x 10° cells. Label the 3 parallels with their degrees of latitude and the 6 meridians with their degrees of longitude.



The parameters are given below of a map projection you have used in this class. Draw on the map above the Central Meridian, Reference Latitude, and Standard Parallels used in this projection.

Put a large dot at the intersection of the Central Meridan and Reference Latitude on the map and label this with the (X,Y) coordinates that this location has in the NAD83 Albers projected coordinate system.

What earth surface property does the NAD 1983 Albers projection preserve regardless of the projection parameters?

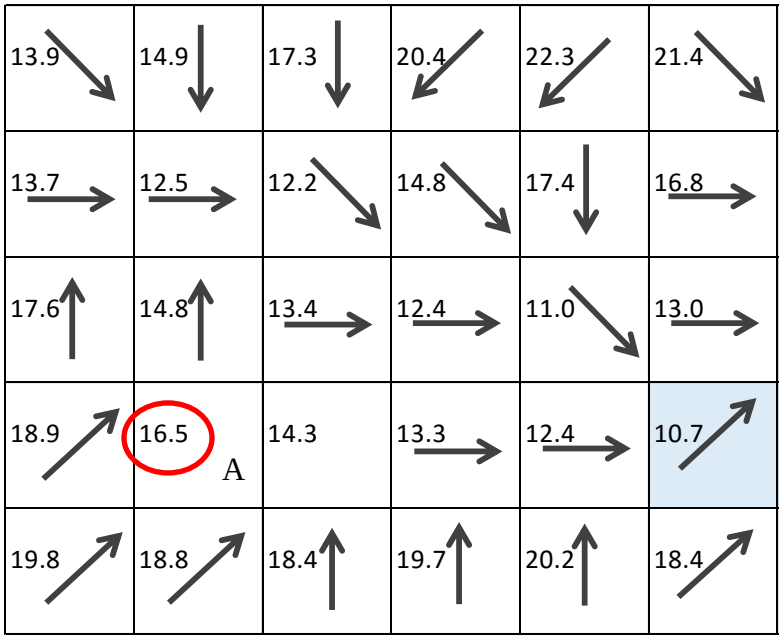
Projected Coordinate System	NAD 1983 Albers
Projection	Albers
WKID	0
Authority	
Linear Unit	Meter (1.0)
False Easting	0.0
False Northing	0.0
Central Meridian	-96.0
Standard Parallel 1	29.5
Standard Parallel 2	45.5
Latitude Of Origin	37.5

Question 3. Raster Analysis of DEMs (40%)

a) The following diagram gives elevation values on a **10 m** DEM grid that is part of a larger DEM being analyzed. D8 flow directions for many (but not all) of the grid cells are shown. Identify any pits by shading them and indicate the elevation to which they need to be raised to fill them so that the DEM is hydrologically conditioned and they can drain.

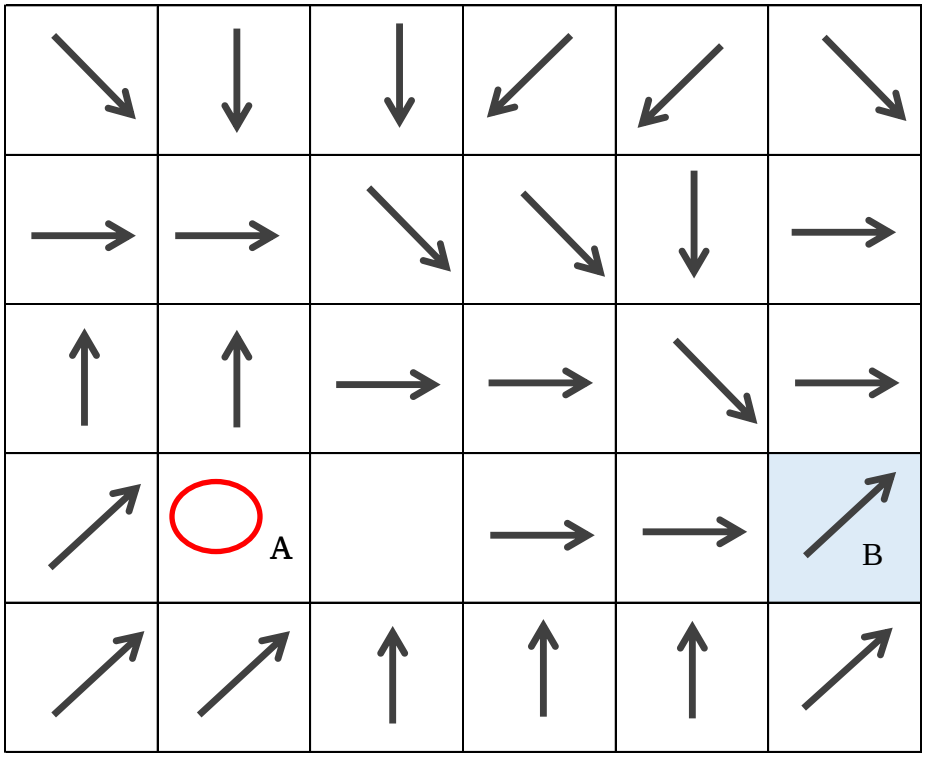
13.9	14.9	17.3	20.4	22.3	21.4
13.7	12.5	12.2	14.8	17.4	16.8
17.6	14.8	13.4	12.4	11.0	13.0
18.9	16.5	14.3	13.3	12.4	10.7
19.8	18.8	18.4	19.7	20.2	18.4

b) D8 flow directions have been evaluated for all but two of these grid cells. Determine the D8 **flow direction** for the grid cells where flow directions are missing and draw them as arrows on the diagram below.



c) Calculate the **hydrologic slope** along its flow direction for grid cell A in (b) above.

d) Write on the diagram below the values of <u>flow accumulation for each grid cell in the DEM</u> by counting how many grid cells drain into each grid cell (as ArcGIS does it). You do not need to worry about counting grid cells outside the area shown.



e) Determine the area (in square meters) of the watershed draining to the shaded cell B above.

f) Draw on the diagram above the stream that would be defined with a flow accumulation threshold of 5 grid cells.

g) Based on the flow directions you have determined trace the path from grid cell A to the stream you mapped above.

h) Based on the DEM elevations in (a) and the path that you just traced determine the flow distance from grid cell A to the stream and the height of grid cell A above the stream.