Name: _____ **GEOL 101 Laboratory** **Grade:** _____

Topographic Map Lab – Topo Basics

Introduction & Purpose:

Topographic maps are extremely scaled-down, two-dimensional models of the Earth's three-dimensional land surface. The characteristic that makes topographic maps unique are contour lines, which are map symbols that express surface relief – ground elevation changes across a given tract of land. The purpose of this lab is to learn how to read, interpret, utilize, and create topographic maps and topographic map profiles.

The major objectives of this laboratory exercise are as follows:

1) Be able to interpret all the necessary map information, including map scale, declination, contour interval, map symbols, and map coordinates.
2) Be able to locate and identify features on a map, including the use of map coordinates, identifying geographic features

Part I. Topographic Maps: Contouring & Relief

Instructions: Carefully read and analyze the section on contouring, topographic relief, and slope gradient in your lab manual – 9A; pages 168 through 184. Below are a set of contouring activities. Complete the following exercises found below, including using the below figures.

1) Color/shade in the area that represents the top of the highest hill on the map in Fig. 9.17 below. Then label the following features: Ridgeline with "***Ridge*"; ** Round hill with "***H***", Saddle with "***S***".

2) Place the correct contour value in empty box on map in Figure 9.18 below. Then color/shade in the area that represents the lowest elevation on the map. Finally, label the closed depression on the map with the initials "CD".

3) Complete the topographic map in Figure 9.19 below using a contour interval of 10 feet. Make sure to label each contour line with its exact elevation above sea level. Make note of the closed depression contour lines.

4) Refer to map in Figure 9.20 for completing the following questions:

a) The contour interval = _____ meters **b)** Total map relief = _____ meters

c) What is the slope gradient from "X" to "Y"? = _____ meters per km. Do calculation below

d) Draw a road from Point "A" to Point "B" such that the road's slope gradient **does not** exceed 20 meter drop per kilometer. Hint: Why do steep hiking trails have "switchbacks"?

5) Very tightly-spaced set of parallel contour lines represent what type of geographic features?

Answer:_____

6) Very broadly-spaced set of parallel contour lines represent what type of geographic features?

Answer:_____

7) Sets of contour lines that form "V"-shaped pattern that *points to higher elevations* represent what sort of general geographic feature? (hint: choose either stream valley or ridge line)

Answer:_____

8) Sets of contour lines that form "V"-shaped pattern that *points to lower elevations* represent what sort of geographic feature? (hint: choose either stream valley or ridge line)

Answer:_____

Figures for Part I: Questions #1 through #8

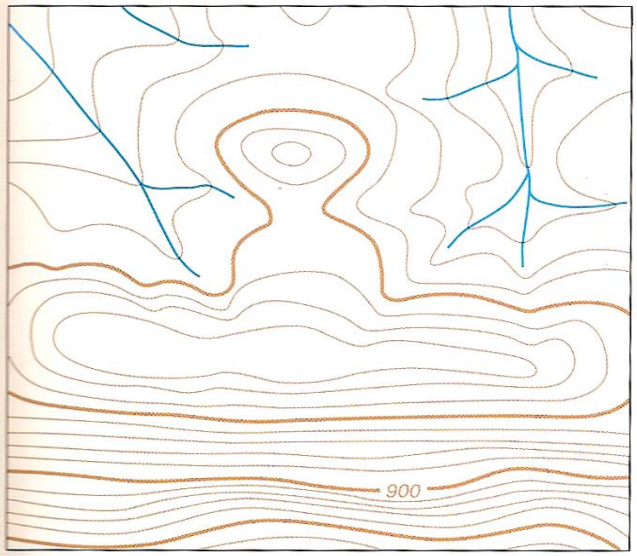


FIGURE 9.17 Topographic map interpretation. Use your pencil to lightly shade in the portion of this map that represents the highest elevation of land. Label a hill, "H." Label a ridge, "R." Label a saddle, "S." Use an arrow to label the lowest contour line in the map and label the arrow with the elevation of the contour. (Refer to Figures 9.5–9.8 as needed.)

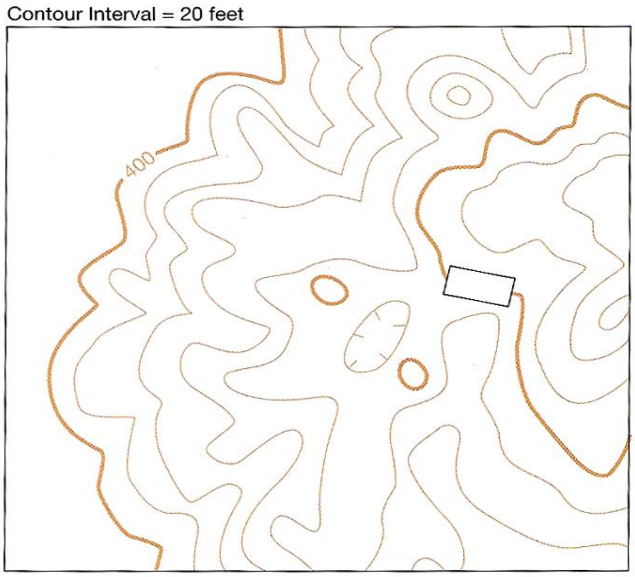


FIGURE 9.18 Topographic map interpretation. Use your pencil to lightly shade in the portion of this map that represents the lowest elevation. Label a closed depression, "CD." In the small box, write the elevation of the index contour on which it lies. (Refer to Figures 9.5–9.8 as needed.)

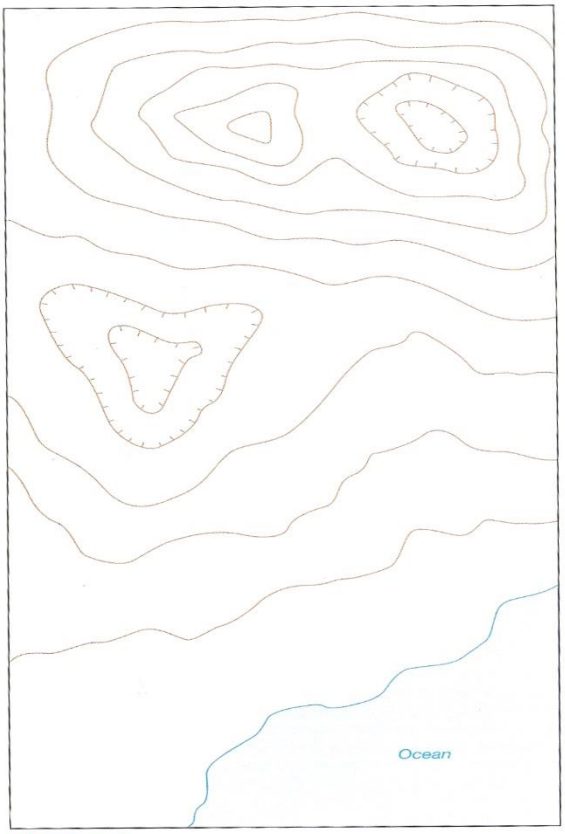
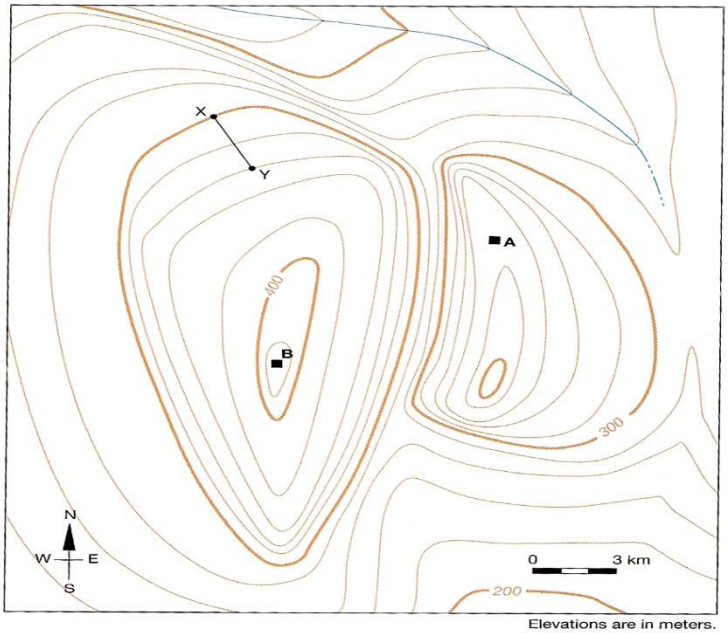


FIGURE 9.19 Complete this topographic map. Use a contour interval of 10 ft and label the elevation of every contour on the map. (*Hint*: Start at sea level and refer to Figures 9.8 and 9.9.)

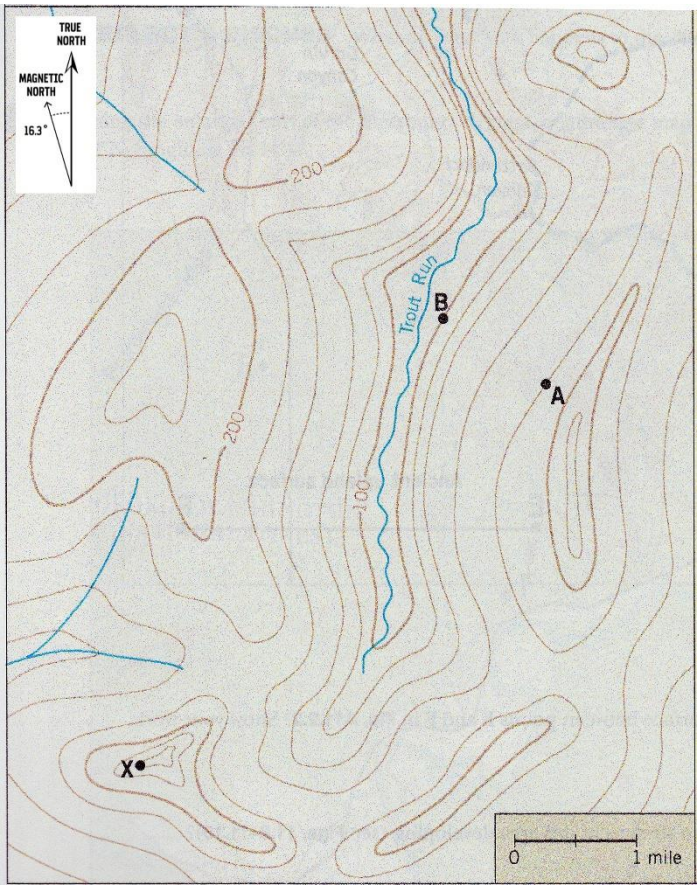


Elevations are in meters.

FIGURE 9.20 *Gradient* is a measure of the steepness of a slope, expressed in feet per mile or meters per kilometer. To determine the gradient of a slope, divide the *relief* (difference in elevation between two points on a map) by the distance measured between the two points. This is sometimes called *rise over run*. For example, this topographic map is contoured in meters. Can you determine the contour interval? Can you determine the gradient from point **X** to point **Y**? Can you plot a path from point **A** to point **B** that does not cross any slopes with a gradient above 20 meters per kilometer? Explain your reasoning.

Part II. Analysis of a Simple Topographic Map

Instructions: Answer the following questions for the Trout Run topographic map illustrated below.



1) What is the verbal scale of this map?

1 inch of map = _____ miles of real ground

2) What is the contour interval? _____feet

3) What's the **index** contour interval? _____ feet

4) What is the total (maximum) relief of the map? (Subtract lowest elevation from highest)

Total relief = _____ feet

5) What is the elevation of Point B? _____ feet

6) What is the elevation of Point X? _____ feet

7) Which direction does Trout Run creek flow?

North or South? _____

8) What is the magnitude (degrees) and direction (W or E) of magnetic declination? _____ ___

9) What is the horizontal distance from point "A" to point "B"? (in miles). _____ miles

10) Dimensions of the map is ___ miles by ___ miles.

11) What is the elevation difference between points "A" and "B" (in feet)? _____ feet

12) What is the slope gradient from "A" to "B"? (in feet per mile). Do the calculation below

Calculation: Answer: _____ feet per mile

Part III. Analysis of Another Simple Topographic Map

Instructions: Answer the following questions for the Math State Park topographic map below

1) The dimensions of the map are _____ miles by _____ miles.

2) What is the verbal scale of this map? 1 inch of map = _____ miles of real ground

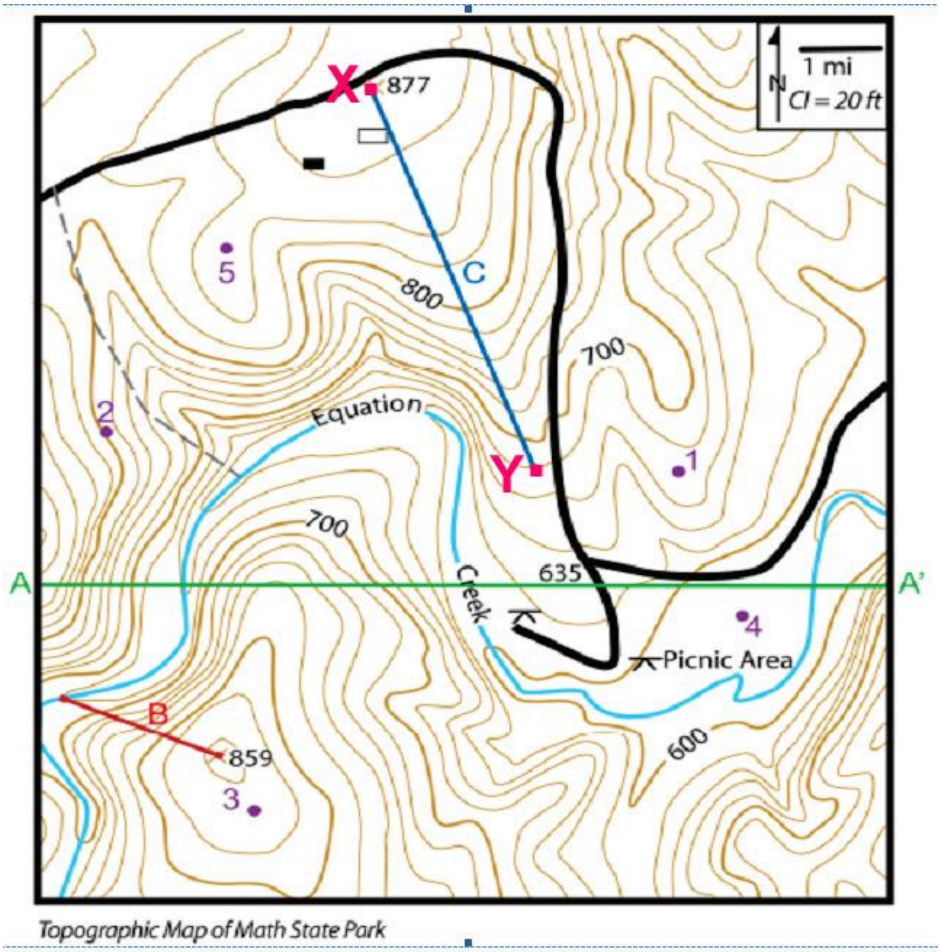
3) What is the contour interval? _____feet **4)** What is the **index** contour interval? ____ feet

4) Which of these locations (points 1 through 5) has a **lowest** elevation? _____

5) Which of these locations (points 1 through 5) has a **highest** elevation? _____

6) The elevation of Picnic Area is _____ feet. Estimate the elevation of Point 5. _____ feet.

7) What is the total (maximum) relief of the entire map? Total relief = _____ feet



Topographic Map of Math State Park

8) What is the distance of from point "X" to point "Y" (in miles)? _____ miles.

9) What is the bearing (direction) from point "X" to point "Y"? Azimuth: _____ Quad: _____

10) What is the slope gradient for Line "B"? (in feet per mile). Do the calculation below.

Calculation: Answer: _____ feet per mile

11) Which direction does Equation Creek flow? East or West? _____

PART IV – Earthquake Valley Quadrangle Topographic Map

Directions: Study the topographic map provided to you by your instructor. Answer the following map questions.

1) What is the size of this map? It's a _____ minute by _____ minute map

2) The verbal scale is "One inch of map distance equals _____mile(s) of real ground distance

3) The magnetic declination for this mapped region is _____ _____

4) What sort of vegetation covers this region? _____

5) Name the geographic location listed on the map with the following **UTM** coordinates.
Northing: 3.662,000 m N, Easting: 549,000 m E NOTE: **This is** Location "A" **.**

Name of location A: _____

6) What are the **latitude-longitude** coordinates for the Airstrip in Earthquake Valley?

Location B: Latitude = _____ Longitude = _____

7) What is the distance from Location A **(Question 5)** to Location B **(Question 6)**?

Distance is _____ miles

8) What is the **AZIMUTH** bearing from **Location A** (Question 5) to **Location B** (Question 6)?

Azimuth bearing from locations A to B is _____ degrees

9) Which of the following ***quadrant*** compass bearings is the most accurate for the direction starting from **Location A** (Question 3) and heading to **Location B** (Question 4)?

Quadrant bearing from locations A to B is _____

10) What's the **slope gradient** from top of Granite Mountain to the Spring at its base (north side)?

Calc: The slope gradient is roughly _____ feet per mile.

11) The total relief of this mapped region is roughly _____ feet

12) Which direction does Felipe Creek flow? The creek flows towards the _____ direction

13) What type of active geologic structure do you think runs down Earthquake Valley?

Part V. Analysis of the Yosemite Valley Topographic Map

Instructions: Complete the following map analysis activities for the Yosemite Topographic Map

General Topographic Information of this Map

1) What type of map projection was used to make this map? _____

2) The size of the map is _____ minutes by _____ minutes

3) What is the fractional ratio scale of this map? 1: _____

4) What is the verbal scale of this map? 1 inch of map = _____ miles of real ground

5) What is the amount and direction of magnetic declination? _____ _____

6) What is the contour interval? _____feet; Index contour interval (between the thicker lines)? _____feet

7) What is the highest contour elevation on this map? _____ feet

8) What is the lowest contour elevation on this map? _____ feet

9) What is the maximum relief of the map? (Subtract lowest map elevation from highest elevation)

Total relief = _____ feet

10) What's the name of the adjacent topo map to the northeast of this map? _____

Map Features and Symbols

11) What's the difference between the *solid* green pattern and *small dotted* green pattern on this map? _____

12) What's the difference between black dashed single lines and black dashed double lines?

_____

13) What's the difference between black dashed double lines and black solid double lines?

_____

Map Coordinate Systems

14) What are the black longitude and latitude tick mark intervals along the edge of map? _____

15) Which UTM zone is this map area located in? _____

16) What are the blue UTM tick mark intervals along the edge of the map? _____ meters apart

Establishing Location

17) Interpolate the best approximate **longitude and latitude** for these locations:

	Half Dome	El Capitan
Longitude:	_____	_____
Latitude:	_____	_____

18) Interpolate the best approximate **UTM coordinates** for these locations:

	Clouds Rest	Mt Star King
Easting:	_____	_____
Northing:	_____	_____

Establishing Bearing and Distance

19) Calculate the bearing and distance from Half Dome to Clouds Rest.

Quadrant bearing: _____

Azimuth bearing: _____

Distance (miles): _____

20) Calculate the bearing and distance from Glacier Point to Bridalveil Falls.

Quadrant bearing: _____

Azimuth bearing: _____

Distance (miles): _____

Geographic Features

21) Which direction does the Merced River Flow through Yosemite? East or West? Explain.

Answer: _____

22) What special name is used in Yosemite Valley for high promontories that form rounded, flat-topped "bulls-eye" patterns? (hint: rhymes with "home") _____

Part VI. Topographic Map Laboratory Reflection

Directions: Write a 3-point reflection of the lab activity, explaining its purpose, the methods used, the results obtained, and a brief personal reflection of what you enjoyed and learned about doing this topographic map lab (*3 points possible*). Answer the following 3-point question reflection set.

1) *What was the purpose of this lab? What did you actually discover and learn during this lab?*

_____

_____

_____

2) *What did you enjoy most about this lab? Also, what was challenging or thought-provoking?*

_____

_____

_____

3) *What are your constructive comments about the design and execution of this lab? What's good? What's bad? Offer suggestions for making the lab better.*

_____

_____

_____