

Test 2: Math 100

October 26, 2004

Name:

Score:

Note

- Please read the questions carefully before you begin to answer them.
- Write your answers neatly, legibly and with the necessary arguments to explain the method used. Points will be deducted for illegible answer sheets.
- All graphs must be drawn to a reasonable scale. Mark all the necessary labels on the graphs.
- Please write in the space provided to you.
- Tests must be returned stapled. Unstapled submissions will result in -5 points.
- The essay must be typed, 12pt font, single spaced and stapled to the back of the test. The length for the essay must about 2 typed pages.
- You may use Excel to do the test. Any Excel printouts must be stapled to the relevant part of the test.
- Test is due back in class in a week, November 4. Late submissions will not be accepted.
- Please do not discuss the test with you fellow classmates. Cheating will result in an automatic F-grade.

Question 1. (25 pts) Coordinate Systems.

(a) Draw a rectangular coordinate system below and mark the points, $P_1 = (1, 2)$, $P_2 = (2, -5)$, $P_3 = (-1, 2)$ and $P_4 = (-2, -5)$ on the graph. Label each of the points by their coordinates. Draw lines connecting each point with every other point.

(b) For any two points $P_1 = (x_1, y_1)$ and $P_2 = (x_2, y_2)$, the Euclidean distance, which we shall call d , between the two points is given by the formula :

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}.$$

Using this formula, find the distance between the points P_1P_2 , P_1P_3 , P_1P_4 , P_2P_4 , P_3, P_4 and P_2P_3 . Record your answers in the table below.

Points	Distance
$P_1 - P_2$	
$P_1 - P_3$	
$P_1 - P_4$	
$P_2 - P_3$	
$P_2 - P_4$	
$P_3 - P_4$	

(c) Does this formula for d give us the shortest distance between any two point ? Do we may any assumptions here ? Can this formula be used to measure the distance between any two cities on our planet, for instance ? Please explain your answer in some detail.

Question 2. (25 pts) Latitudes and Longitudes. Consider two cities, Pittsburgh with approximate coordinates $(40^\circ N, 80^\circ W)$. Recall that the latitude and longitudes are measured with respect to the Equator and Prime Meridian in Greenwich, respectively. The coordinates for the city of Havana in Cuba is approximately $(23^\circ N, 80^\circ W)$. Assuming that Pittsburgh and Cuba are on the same Longitudinal circle, estimate the distance between the two cities.

(a) As a first step, using the fact that the diameter of the Earth is about 7900 miles, compute the circumference of the Earth, denoted C . This is given by the formula $C = \pi D$, where use $\pi = 3.14$ and $D = 7900$ miles.

(b) Recall that the angle subtended by the entire longitudinal circle is 360° . So if the angle of 360° corresponds to a distance of C miles, compute the distance corresponding to 1° .

(c) With the information from parts (a) and (b), and given the coordinates for Pittsburgh and Cuba, estimate the distance between the two cities.

(d) Is this distance that we have estimated close to the true distance between these two cities ? You may want to find out the true distance and compare it with our estimate.

(e) The approximate coordinates for Chicago are ($40^{\circ}N, 88^{\circ}W$). Make a rough sketch of the Earth with Pittsburgh and Chicago marked on it. Draw the shortest path that connects them both ? Can you estimate the distance between these cities using the same method that we used for Pittsburg and Havana ? Explain your answer.

Question 3. (25 pts) Consider an investment of \$4500 in a trust fund for 6 years.

(a) What is the amount earned if the investment yields a simple interest of 2.5% ?

(b) What is the amount earned if the investment yields a compound interest of 2.5% (compounded annually) ?

(c) What is the amount earned if the investment yields a compound interest of 2.5% (compounded half yearly) ?

(d) In the table below fill in the blank cells, indicating the change in amount earned with years for each of the three investments mentioned above (SI=Simple Interest, CI=Compound Interest).

Year	2.5% SI	2.5% Annual CI	2.5% Half yearly CI
1			
2			
3			
4			
5			
6			

(e) Please draw a graph representing the trends that you see in the table above.

Question 4. (25 pts) Essay: Based on the discussion in class and your own research, discuss the role of Euclidean (EG) and Non-Euclidean(NEG) geometry in our everyday lives. What does NEG tell us about the nature of scientific truths ? Explain with examples, what you consider interesting about NEG and how they may be applied in our daily lives.