MA 105-05  
QUIZ 4

Name:  
ID Number:  

Please try to show your work and give justifications for your answers.  
It is permitted to use calculators on the quiz. Try not to spend too  
much time on any single problem; if you get stuck on a problem leave  
a partial answer and move on to the next.

(1) For the graph shown in Problem 32, Page 422 of the text,  
   a) (5 pts) How many vertices does the graph have?  
   b) (5 pts) How many edges does the graph have?  
   c) (5 pts) How many regions do the edges of the graph divide  
          the page into?  
   d) (5 pts) Add the number of vertices to the number of re-  
          gions, then subtract the number of edges. Does your result  
          agree with Euler’s Theorem about the value of $V - E + R$? If  
          not, why not?

(2) (20 pts) Does the graph in Problem 32, Page 422 have an Euler  
        circuit? How do you know?
(3) (20 pts) The cities of Atlanta, Boston, Chicago, Dallas and Minneapolis are vertices of a graph whose edges are highways. The lengths of these edges are given in a table on page 413. Find a minimum spanning tree for this graph. (Suggestion: sketch the graph, then darken edges that are in the spanning tree or mark them with tick marks. You may redraw the graph on the back of this sheet if you make a mistake.)

(4) (10 pts) Is the graph from problem 1 topologically equivalent to the graph discussed above? Why or why not?

(5) (15 pts) The diagram on page 422 shows how London’s Underground divides the city into regions. Color the regions (including the region outside the map) with four different colors in such a way that no two adjacent regions have the same color. Regions which meet only at their corners may have the same color.

(6) (15 pts) In your own words, describe the Traveling Salesperson Problem.