MAD 2104 June 10, 2010
Quiz 6 Key Prof. S. Hudson

1) [10pts each] Given the matrix for a relation R below, find these 3 matrices (and label your 3 answers clearly!):

a) the matrix for R^{-1}
b) the matrix for $\overline{R}$
c) the matrix for R^2

$$M_R = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}$$

2) [40pts] Answer True or False:

A circuit must begin and end at the same vertex.

If the graph G contains a vertex a and H does not, then G is not isomorphic to H.

If a simple graph G contains exactly 5 vertices, then its incidence matrix is $5x5$.

The 3-cube Q_3 is bipartite.

There is a simple path between every pair of distinct vertices of a connected undirected graph.

3) [30pts] Choose ONE: (you can answer on the back):

a) Prove that if R is transitive on a set A, then $R^n \subseteq R$ for all positive integers n.

b) Define a relation R on Z by $R = \{(x, y) : (x + 1)^2 = (y + 1)^2\}$. Show that R is an equivalence relation.

Remarks and Answers: The average among the top 20 students was 80 / 100. Here is a rough scale for the quiz, based mainly on that average:

As 85 to 100
Bs 75 to 84
Cs 65 to 74
Ds 55 to 64

I wrote your letter grade on your quiz in blue. Also, the sum of your best 5 out of 6 quiz grades is written in red near the date, along with your semester letter grade so far. That grade is based on the following scale. Check your total and letter grade!

As 400 to 500
Bs 350 to 399
Cs 300 to 349

Ds 250 to 299

1) This is 8.3.13. For a), you transpose the matrix. For b), you change 0s to 1s, and 1s to 0s. For c), compute a Boolean product.

2) TFFTT

3a) is the 'only if' part of Thm 1 in Ch 8.1 (and there is no reason to include the 'if' part in your proof). Sometimes textbook proofs are very minimal to save space; a full proof should include 'Assume R is transitive' and a little more about the basis step, as I did in class.

3b) This is probably much easier than a), but wasn't advertised, and almost nobody chose it (just go through the usual 3 steps; prove reflexive, etc).