Math 205 A B Quiz 04 page 1 10/12/2012 Name *Suggested solution - gdd version*

1. Suppose $M = \begin{bmatrix} 5 & 3 & 1 \\ 20 & 10 & b \end{bmatrix}$, $N = \begin{bmatrix} c & s & 2 \\ c & t & 5 \\ c & 3 & 3 \end{bmatrix}$ and $MN = \begin{bmatrix} 36 & 36 & a \\ z & 280 & 240 \end{bmatrix}$.

Find the values of all those unknowns. Hint: it will be easy if you find them in more-or-less alphabetical order. There are many equations you can write down, but aim for those with as few unknowns as possible.

$$a = 5\cdot 2 + 3\cdot 5 + 1\cdot 3 = 10+15+3 = 28$$ (a is 1st row * 3rd column)

(240 is 2nd row * 3rd column)

$$20\cdot 2 + 10\cdot 5 + b\cdot 3 = 240$$
$$40 + 50 + 3b = 240$$
$$3b = 240 - 90 = 150$$
$$b = 50$$

$$5c + 3c + 1c = 36$$ (using the 36 in the 1st row, 1st column of MN)
$$9c = 36 \quad c = 4$$

Answers: $a = \boxed{28}$ $b = \boxed{50}$ $c = \boxed{4}$

$$\begin{cases} 5s + 3t + 3 = 36 \\ 20s + 10t + 3b = 280 \end{cases}; \; 3b = 150 \text{ so}$$

$$\begin{cases} 5s + 3t = 33 \\ 20s + 10t = 130 \end{cases} \leftrightarrow \left[\begin{array}{cc|c} 5 & 3 & 33 \\ 2 & 1 & 13 \end{array}\right] \sim \left[\begin{array}{cc|c} 1 & 0 & 6 \\ 0 & 1 & 1 \end{array}\right] \Rightarrow \begin{array}{l} s = 6 \\ t = 1 \end{array}$$

$$z = \text{“2nd row * 1st col”} = 20c + 10c + bc = (20+10+50)(4)$$

$s = \boxed{6}$ $t = \boxed{1}$ $z = \boxed{320}$ $$= 80\cdot 4 = 320$$

BONUS: How many pairs of numbers have to multiplied to find the product of a 3×7 by a 7×10 matrix? Explain. (No credit for a guess).

the product has $3 \times 10 = 30$ entries, each of which requires 7 pairs of numbers to be multiplied $\therefore$ 210 total multiplications