Finite Math Section 2_5
Solutions and Hints

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for the book:
Finite Mathematics, 7th Edition
by S. T. Tan.

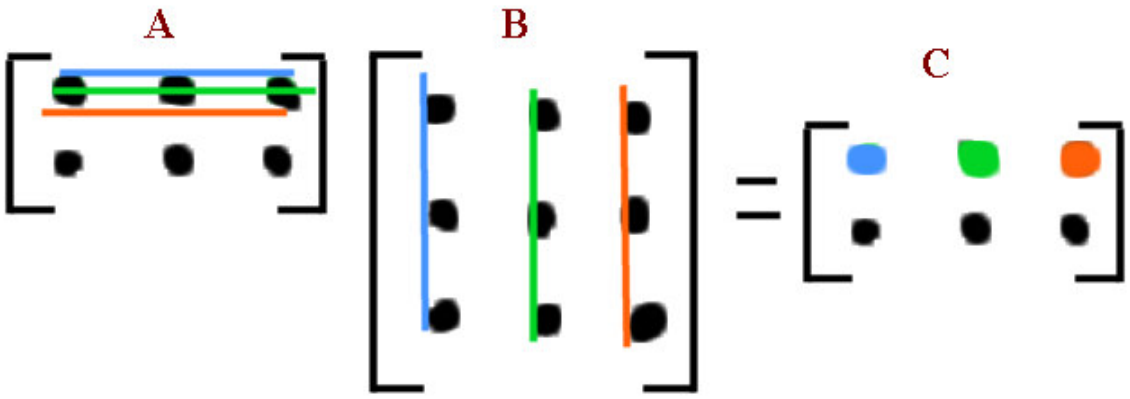
DO NOT PRINT THIS OUT AND TURN IT IN !!!!!!!!
This is designed to assist you in the event you get stuck.
If you do not do the work you will NOT pass the tests.

Section 2.5:

While this section can also be done by using a calculator it is EXTREMELY important to know how to multiply matrices by hand (oddly it comes up a lot in bizarre circumstances when you don't have a calculator – sometimes like tests and other classes).

There are probably 2 things to remember about multiplying matrices:

1. If you are to multiply A*B then the number of columns of A must EQUAL the number of rows of B (e.g. if A is 2 x 3 then B must be 3 x [whatever])
2. Multiplication is done in the pattern of a 7:



Assuming the above depicts AB = C,
Following the blue line (notice it kind of forms a 7) gives us:

a11*b11 + a12*b21 + a13*b31 = c11

Following the green line (again kind of forming a 7) gives us:
a11*b12 + a12*b22 + a13*b32 = c12

Following the red line gives us:
a11*b13 + a12*b23 + a13*b33 = c13

Problem 14:
Compute the indicated product:

$$\begin{bmatrix} -1 & 2 \\ 4 & 3 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 2 & 1 & 2 \\ 3 & 2 & 4 \end{bmatrix} = \begin{bmatrix} -1*2+2*3 & -1*1+2*2 & -1*2+2*4 \\ 4*2+3*3 & 4*1+3*2 & 4*2+3*4 \\ 0*2+1*3 & 0*1+1*2 & 0*2+1*4 \end{bmatrix} = \begin{bmatrix} 4 & 3 & 6 \\ 17 & 10 & 20 \\ 3 & 2 & 4 \end{bmatrix}$$

Problem 36:
Write the given system of equations in matrix form.

Notice this does NOT mean as an augmented matrix.

2x = 7
3x – 2y = 12

What we are told to write is the system of equations such that A**x** = **b**,
where A is a matrix **x** = [x y]^T and b = a vector of numbers.

To do this we take the coefficients and put them in a matrix.
Notice the coefficients of x go in column 1, coefficients of y go in column 2 and if there had been z's their coefficients would go in column 3.

So our matrix is:

$$A = \begin{bmatrix} 2 & 0 \\ 3 & -2 \end{bmatrix}$$

Our vector of variables is:

$$\mathbf{x} = \begin{bmatrix} x \\ y \end{bmatrix}$$

And our numbers vector is (the stuff on the right of the equal sign):

$\mathbf{b} = \begin{bmatrix} 7 \\ 12 \end{bmatrix}$

So putting it all together,

the answer is: $\begin{bmatrix} 2 & 0 \\ 3 & -2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 7 \\ 12 \end{bmatrix}$

Problem 44:
Four theaters comprise the Cinema Center: cinemas I, II, III, IV. The admission price for one feature at the Center is \$2 for children, \$3 for students and \$4 for adults. The attendance for the Sunday matinee is given by the matrix:

$$A = \begin{array}{c} \\ \text{Cinema I} \\ \text{Cinema II} \\ \text{Cinema III} \\ \text{Cinema IV} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Children} & \text{Students} & \text{Adults} \end{array} \\ \begin{bmatrix} 225 & 110 & 50 \\ 75 & 180 & 225 \\ 280 & 85 & 110 \\ 0 & 250 & 225 \end{bmatrix} \end{array}$$

Write a column vector B representing the admission prices.

This you need to make sure is in the same order as the columns of A are, so you get:

$$\mathbf{B} = \begin{bmatrix} \$2 \\ \$3 \\ \$4 \end{bmatrix}$$

Then compute AB, the column vector showing the gross receipts for each theater.

$$AB = \begin{bmatrix} 225 & 110 & 50 \\ 75 & 180 & 225 \\ 280 & 85 & 110 \\ 0 & 250 & 225 \end{bmatrix} \begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix} = \begin{bmatrix} 225*2+110*3+50*4 \\ 75*2+180*3+225*4 \\ 280*2+85*3+110*4 \\ 0*2+250*3+225*4 \end{bmatrix} = \begin{bmatrix} 980 \\ 1590 \\ 1255 \\ 1650 \end{bmatrix} = \mathbf{AB}$$

Thus we know
Cinema I made $980
Cinema II made $1590
Cinema III made $1255
Cinema IV made $1650

Finally, find the total revenue collected at the Cinema Center for admission that Sunday afternoon.

And the total income is the sum of all 4 = 980+1590+1255+1650 = **$5475**