EXAM 1 on FRIDAY

10 x 5pt m. choice

7 workout 5-10pt each

$\approx$ 1/3 Ch 1.2 - 1.5 $\approx$ 1/3 Ch 2.1-2.3 $\approx$ 1/3 Ch 2.4-2.7

ID, Calc., sharp pencil seating chart

No scratch paper

50 MINUTES

Exam 1 Review

1. Is the given matrix in row-reduced form? $\left[\begin{array}{cccc|c} 1 & 0 & -2 & 0 & 0 \\ 0 & 1 & 1 & 1 & -3 \\ 0 & 0 & 0 & 0 & 4 \end{array}\right]$

A. No, the matrix is missing a leading 1 in row 3.
B. No, column 4 should be all 0's.
C. No, the -2 should be a 0.
D. Yes, it meets all the criteria.
E. None of these

2. Let matrix A represent the number of bicycles in stock of brands Tiger (T) and Snake (S) at stores in Paddington (P) and Quentin (Q). Let matrix B represent the proportion of bikes from brands T and S that are road bikes (R) and mountain bikes (M).

$$(2\times 2)\cdot(2\times 2)$$

Labels, too!

$$A = \begin{array}{c} \\ T \\ S \end{array}\begin{array}{c} \begin{array}{cc} P & Q \end{array} \\ \begin{bmatrix} 60 & 75 \\ 45 & 50 \end{bmatrix} \end{array} \qquad B = \begin{array}{c} \\ R \\ M \end{array}\begin{array}{c} \begin{array}{cc} T & S \end{array} \\ \begin{bmatrix} 0.5 & 0.8 \\ 0.5 & 0.2 \end{bmatrix} \end{array}$$

Consider the product of these two matrices, called C. Which of the following is a true statement about C?

A. $C = \cancel{AB}$ and represents the number of road and mountain bikes in stock at each store.

B. $C = BA$ and represents the number of road and mountain bikes in stock at each store.

C. $C = \cancel{AB}$ and represents the number of Tiger and Snake brand bikes in stock at each store.

D. $C = BA$ and represents the number of Tiger and Snake brand bikes in stock at each store.

E. None of these

$$\begin{array}{r} \\ \text{Road bike (prop)} \\ \text{Mt bike (prop)} \end{array}\begin{array}{c} \begin{array}{cc} \text{Tiger} & \text{Snake} \end{array} \\ \begin{pmatrix} .5 & .8 \\ .5 & .2 \end{pmatrix} \end{array} \cdot \begin{array}{r} \\ \text{Tiger} \\ \text{Snake} \end{array}\begin{array}{c} \begin{array}{cc} \text{Padd.} & \text{Quent} \end{array} \\ \begin{pmatrix} 60 & 75 \\ 45 & 50 \end{pmatrix} \end{array}$$

$$\begin{array}{r} \\ \text{Road} \\ \text{Mtn} \end{array}\begin{array}{c} \begin{array}{cc} \text{Padd} & \text{Quent} \end{array} \\ \begin{pmatrix} \underbrace{.5 * 60}_{\text{\# Tiger Rd bikes in Padd}} + \underbrace{.8 * 45}_{\text{\# snake Rd bikes in Padd}} & \\ & \end{pmatrix} \end{array}$$

3. Solve the following matrix equation for X: $2X + D = XB$.
You may assume that if an inverse is needed, it exists and that all matrix addition and subtraction are defined.

$D = XB - 2X = X \cdot B - X \cdot 2I$

$= X(B - 2I)$

$D(B-2I)^{-1} = X \underbrace{(B-2I)(B-2I)^{-1}}_{I}$

$X = D(B-2I)^{-1}$

4. A cordless drill company has monthly fixed costs of \$92,500. If each month 12,000 cordless drills are produced and sold for \$130 each, then there is a profit of \$795,500.

(a) Find the linear cost function.

(b) Each month how much revenue is generated at the break-even point?

$C(x) = cx + F = cx + 92{,}500$

$R(x) = sx = 130x$

$P(x) = R - C = 130x - (cx + 92500) = (130 - c)x - 92500$

$795{,}500 = P(12000) = (130 - c)(12000) - 92500$

$888{,}000 = 1{,}560{,}000 - 12000c \Rightarrow c = 56$

$\boxed{C(x) = 56x + 92500}$ where x is the number of drills and C is the total cost in \$

b) BE @ $P = 0$ or $R = C$

$130x = 56x - 92500 \rightarrow x = 1250$ drills

$R(1250) = 130(1250) = \$162{,}500$

$X = (I - A)^{-1} D$

5. The economy of the stone-age village Bedrock has three industries, stone cutting (*S*), farming (*F*), and hunting (H). The input-output matrix is given below and the demand from the local city of Rock Vegas is \$1500 of stone, \$6500 of farming and \$4000 of hunting. How much of stone, farming, and hunting needs to be produced in total to meet all demands?	$[A] = \begin{array}{c c} & \begin{array}{ccc} S & F & H \end{array} \\ \begin{array}{c} S \\ F \\ H \end{array} & \begin{bmatrix} 0.3 & 0.3 & 0.25 \\ 0.2 & 0.25 & 0.3 \\ 0.2 & 0.1 & 0.2 \end{bmatrix} \end{array}$ To make 1 unit of S requires .3 of S .2 of F .2 of H

$[B] = \begin{pmatrix} 1500 \\ 6500 \\ 4000 \end{pmatrix}$ $\quad (\text{identity}(3) - [A])^{-1} [B] = \begin{bmatrix} 12693.63\ldots \\ 16127.366\ldots \\ 10189.3287\ldots \end{bmatrix}$

\$12694 of stone, \$16127 of farming, \$10189 of hunting

STAT EDIT

6. Six people were asked their annual income (in thousands of dollars) and the average number of hours they spend watching television each week. The data collected is shown in the following table.

Income (x)	10	27	38	55.5	70	100	L1
Hours watching TV (y)	50	33	28	20	12	6	L2

(a) Find the equation of the least-squares line for this data. If needed, round the coefficients to 4 decimal places.

(b) Using the unrounded least-squares equation, estimate the average number of hours of televisions watched per week by a person with an annual income of $45,800

(c) Using the unrounded least-squares equation, estimate the annual income (to the nearest dollar) of a person who watches an average of 10 hours of television per week.

a) LinReg $\rightarrow$ $y = -0.4723x + 48.4871$

b) Y= screen, VARS, Statistics, EQ, RegEq

Turn on STAT PLOT, ZOOMSTAT

$x = 45.8$ CALC $\rightarrow$ value

$y = 26.9$ hours

c) $Y_2 = 10$, CALC $\rightarrow$ intersect $\rightarrow$ $x = 81.490674$

$\times 1000$

\$ 81,491

7. Which of the following are particular solutions to the parametric solution$(3t-7,-2s+1,s,t)$?

A. $(-7,1,0,0)$ **B.** $(-4,1,0,1)$ ~~**C.**~~ $(-7,1,\cancel{1},0)$ -1 **D.** $(-4,-1,1,1)$

E. None of these

A $s=0$ $t=0$

B $s=0$ $t=1$

C $s=1$ $t=0$

$\left[\begin{array}{cc|c} .15 & 1 & 8 \\ -.08 & 1 & 1.1 \end{array}\right]$

8. The supply and demand for cartons of blueberries are given by the equations

$$p = D(x) = -0.15x + 8$$

$$p = S(x) = 0.08x + 1.1$$

$.15x + p = 8$

$-.08x + p = 1.1$ $\xrightarrow{\text{rref}} \left[\begin{array}{cc|c} 1 & 0 & 30 \\ 0 & 1 & 3.5 \end{array}\right]$

Where p is the price in dollars and x is the number of cartons of blueberries.

A. What is the lowest price the supplier is willing to accept for a carton of blueberries?

B. Find and interpret the equilibrium point.

(A) at $x = 0 \longrightarrow p = \$1.10$

(B) $x = 30$ and $y = 3.5$

A total of 30 cartons of bb will be supplied and purchased at a price of \$ 3.50 each.