Math 199
Summer II 2006 Name: **Solutions**
Quiz 2 - §§1.5 - 1.6, 3.3

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1. Solve (by hand) the following system of equations:

$$0.5x + y = 3$$
$$0.3x + 0.2y = 6$$

Solve the first equation for y:

$$y = 3 - .5x$$

Plug into the second equation:

$$0.3x + 0.2(3 - 0.5x) = 6$$
$$0.3x + 0.6 - 0.1x = 6$$
$$0.2x = 5.4$$
$$x = 27$$

Plugging back in:

$$y = 3 - .5(27) = -10.5$$

2. Use your calculator to solve the following system of equations:

$$3x + 2y - 4z = -12$$
$$3x - 3y + 2z = -15$$
$$4x + 6y + z = 0$$

The corresponding matrix is:

$$\left[\begin{array}{ccc|c} 3 & 2 & -4 & -12 \\ 3 & -3 & 2 & -15 \\ 4 & 6 & 1 & 0 \end{array}\right]$$

Using rref on the calculator, we have:

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & -\frac{114}{31} \\ 0 & 1 & 0 & \frac{69}{31} \\ 0 & 0 & 1 & \frac{42}{31} \end{array}\right]$$

So the answer is $x = -\dfrac{114}{31}, y = \dfrac{69}{31}, z = \dfrac{42}{31}$.

There is a problem on the back

3. A company manufactures and sells bookcases. The selling price is \$54.90 per bookcase. The total cost function is linear, and costs amount to \$50,000 for 2000 bookcases and \$32,120 for 800 bookcases.

   (a) Find the cost function.

   We know that the points $(2000, \$50,000)$ and $(800, \$32,120)$ are on the line. Finding the slope, we get:

$$m = \frac{50,000 - 32,120}{2000 - 800} = \frac{17,880}{1200} = 14.9$$

   Then, using the point-slope form of the equation of a line, we have:

$$y - \$32,120 = 14.9(x - 800)$$

$$C(x) = 14.9(x - 800) + 32,120$$

$$= 14.9x - 11,920 + 32,120$$

$$= 14.9x + 20,200$$

   (b) Find the revenue function.

   Since revenue is price per item times number of items sold,

$$R(x) = 54.90x$$

   (c) Find the break even point.

   This is where revenue = cost:

$$14.9x + 20,200 = 54.90x$$

$$40x = 20200$$

$$x = 505$$

   So, need to sell 505 bookcases to break even.

Bonus. What type of system of equations is given in problem #3?

The system is independent since it has exactly one solution.