1) (4 points) Find the equation of the line in slope-intercept form that passes through the points $(5,-3)$ and $(7,4)$:

$m = \frac{4-(-3)}{7-5} = \frac{7}{2}$

$y-4 = \frac{7}{2}(x-7)$

$y-4 = \frac{7}{2}x - \frac{49}{2}$

$y = \frac{7}{2}x - \frac{41}{2}$

2) (4 points each) It was found that the price and demand for a Cactar plushie can be given by $p = D(q) = 138 - 1.23q$ where p is price in dollars and q is the demand in hundreds of plushies. Suppose that the price and supply (in hundreds of plushies) is given by $p = S(q) = 1.27q$. Rounding answer to the nearest whole number…

a) Find and interpret, using the language of the problem, the following.

i) $D(60)$

$138 - 1.23(60) = 64.2$

When the price is \$6420, 6000 plushies are demanded

ii) $S(26)$

$= 1.27(26)$

$= 33.02$

When the price is \$3300, 2600 were supplied

b) Find the demand when the price is \$42.50:

$42.50 = 138 - 1.23q$

$-95.5 = -1.23q$

$q \approx 78$ hundred

c) Find the supply when the price is \$42.50:

$42.5^{\circ} = 1.27q$

$q \approx 33$ hundred

d) Find the equilibrium quantity and equilibrium price:

$138 - 1.23q = 1.27q$

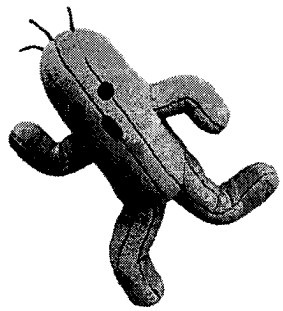
$138 = 2.5q$

$q = 55.2$

$q \approx 55$

$1.27(55) = p$

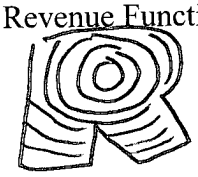
$p \approx 70$



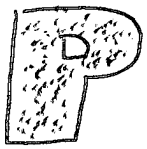
3) (2 points each) Short answer: In your own words, describe the formula for the…

a) Cost Function:

b) Revenue Function:



c) Profit Function:



4) (4 points each) Mary buys a Cricut cutting machine for $420.25 and plans to make custom aprons to sell with the machine. Each apron costs $12.50 to make and she plans to sell them for $22.75 each.

a) Write and label the corresponding Revenue, Cost, and Profit functions for this problem:

$R(x) = 22.75x$

$C(x) = 12.50x + 420.25$

$P(x) = 22.75x - (12.50x + 420.25)$

$= 10.25x - 420.25$

b) How many aprons must be sold to break even?

$R(x) = C(x)$

$22.75x = 12.50x + 420.25$

$10.25x = 420.25$

$x = 41$

c) If they sell 5 aprons a week, **during** which week will she be able to break even?

$\frac{41}{5} = 8.2$

During the 9th week

5) (3 points each) Consider the following data (source: Census.gov):

Year	2010	2011	2012	2013	2014	2015	2016
Percentage of people 25 years or older that have completed 4 years of college or more	29.9	30.4	30.9	31.7	32.0	32.5	33.4

Let x be the number of years since 2010 and let y be the percentage of people 25 years or older that have completed 4 years of college or more.

a) Find the equation of the regression line. Round values to two decimal places:

$y = 0.56x + 29.85$

b) Interpret the slope and y-intercept using the language of the problem:

"WHERE'S THE ANSWER?"

c) Predict the percentage of people that completed more than 4 years in the year 2018:

$2018 - 2010 = 8$

$y = 0.56(8) + 29.85$

$= 34.33\%$

d) When will 40% of people 25 or older have completed 4 or more years of college?

$40 = 0.56x + 29.85$

$x = 18.125$

During 2028

6) (9 points each) Solve the given system using the methods listed below. Write answer as an ordered triple.

$$\begin{cases} x-4y+2z=-4 \\ 4x-15y+8z=2 \\ -2x+9y-10z=8 \end{cases}$$

a) The Echelon (Elimination) method:

① $2x-8y+4z=-8$
$-2x+9y-10z=8$
$y-6z=0$

② $4x-15y+8z=2$
$-4x+18y-20z=16$
$3y-12z=18$

③ $-2y+12z=0$
$3y-12z=18$
$y=18$

④ $y-6z=0$
$18-6z=0$
$z=3$

$x-4y+2z=-4$
$x-4(18)+2(3)=-4$
$x=62$

$(62, 18, 3)$

b) Gauss-Jordan method:

$$\left[\begin{array}{ccc|c} 1 & -4 & 2 & -4 \\ 4 & -15 & 8 & 2 \\ -2 & 9 & -10 & 8 \end{array}\right] \xrightarrow[2R_2+R_3\to R_3]{-4R_1+R_2\to R_2} \left[\begin{array}{ccc|c} 1 & -4 & 2 & -4 \\ 0 & 1 & 0 & 18 \\ 0 & 1 & -6 & 0 \end{array}\right] \xrightarrow[-R_2+R_3\to R_3]{4R_2+R_1\to R_1} \left[\begin{array}{ccc|c} 1 & 0 & 2 & 68 \\ 0 & 1 & 0 & 18 \\ 0 & 0 & -6 & -18 \end{array}\right] \xrightarrow[-2R_3+R_1\to R_1]{-\frac{1}{6}R_3\to R_3} \left[\begin{array}{ccc|c} 1 & 0 & 0 & 62 \\ 0 & 1 & 0 & 18 \\ 0 & 0 & 1 & 3 \end{array}\right]$$

7) (1 point) Verify that you made absolutely sure that your answer to 6a is the same as in 6b by signing your name here EL TACO JR.. You will not receive the credit if the work does not support the same answer.

8) For the following problem:

A movie theater charges \$9.00 for an adult ticket, \$7.00 for seniors, and \$6.00 for a child's ticket. For the movie *Tom Hanks presents Tom Hanks as Tom Hanks*, the theater sold a total of 290 tickets, which brought in \$2400. The number of adult tickets sold was twice the number of children's tickets sold. How many tickets were sold to adults, to children, and to seniors?

a) (2 points) Name and define your variables for this problem:

x = # of adult tickets

y = # of senior tix

z = # children tix

b) (5 points) Set up **BUT DO NOT SOLVE** a system of equations for this problem:

$$\begin{cases} 9x + 7y + 6z = 2400 \\ x + y + z = 290 \\ x = 2z \end{cases}$$

9) (3 points each) For the matrices $A = \begin{bmatrix} 3 & 2 & 3 \\ -1 & 1 & -2 \\ 0 & 4 & 5 \end{bmatrix}$, $B = [5 \quad 0 \quad 2]$, and $C = [4 \quad 1 \quad 2]$, find the following, if possible. If not possible, explain why:

a) $4B + 5C$

$= [20 \quad 0 \quad 8] + [20 \quad 5 \quad 10] = [40 \quad 5 \quad 18]$

b) CA

$[4 \quad 1 \quad 2] \begin{bmatrix} 3 & 2 & 3 \\ -1 & 1 & -2 \\ 0 & 4 & 5 \end{bmatrix}$

$= [11 \quad 17 \quad 20]$

10) (2 points each) What property must be true to…

a) Add or subtract matrices?

the clouds must part

b) Multiply matrices?

the stars must be aligned

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11) (6 points part *a*; 4 points part *b*) For the system $\begin{cases} 3x-8y=20 \\ -x+6y=10 \end{cases}$ ...

a) Find the inverse of the coefficient matrix algebraically using the Gauss-Jordan Method:

$$\left[\begin{array}{cc|cc} 3 & -8 & 1 & 0 \\ -1 & 6 & 0 & 1 \end{array}\right] \xrightarrow{2R_2+R_1\to R_1,\ R_1+R_2\to R_2} \left[\begin{array}{cc|cc} 1 & 4 & 1 & 2 \\ 0 & 10 & 1 & 3 \end{array}\right] \xrightarrow{\frac{1}{10}R_2\to R_2,\ -4R_2+R_1\to R_1} \left[\begin{array}{cc|cc} 1 & 0 & \frac{3}{5} & \frac{4}{5} \\ 0 & 1 & \frac{1}{10} & \frac{3}{10} \end{array}\right]$$

b) Solve the system using the matrix inverse from part *a*:

$$\begin{bmatrix} 3/5 & 4/5 \\ 1/10 & 3/10 \end{bmatrix}\begin{bmatrix} 20 \\ 10 \end{bmatrix} = \begin{bmatrix} 20 \to x \\ 5 \to y \end{bmatrix}$$

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