**1.** (18pts) The manager of a large clothing store wishes to find a function that relates the daily demand D for men's jeans to the price p of the jeans. The data below were obtained based on a price history of jeans sales.

a) Draw the scatterplot of the data (put p on the x-axis). Does the relationship look linear?

b) Use two points in the scatterplot to get an equation of a line that models the relationship between p and D. Draw the line on the graph.

c) Use your calculator to find the "line of best fit" for the data. Draw the line on the graph.

d) Find the coefficient of correlation r. How strong is the linear relationship between p and D?

e) How many jeans would the store expect to sell daily if the price is \$25?

p ($/pair)	D (pairs of jeans sold per day)
20	60
22	57
23	56
23	53
27	52
29	49
30	44

a)
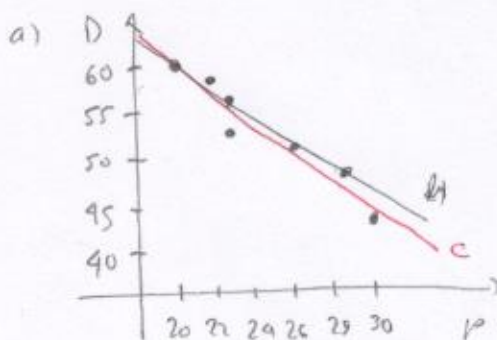
Looks reasonably linear

b) Use $(20,60)$ and $(29,49)$

$$m = \frac{49-60}{29-20} = -\frac{11}{9}$$

$$y - 60 = -\frac{11}{9}(x-20)$$

$$y = -\frac{11}{9}x + \frac{220}{9} + 60 = -\frac{11}{9}x + \frac{760}{9} = -1.222222x + 84.444444$$

c) $y = -1.335526x + 86.197368$

d) $r = -0.949054$, close to -1, so strong linear rel.

e) $y = -1.335526 \cdot 25 + 86.197368 = 52.809218$

About 53 pairs

2. (8pts) Net weights of a sample of coffee packages were within 13 grams of the declared net weight of 500 grams.

a) If w is the net weight of a sample package, write an inequality involving absolute value that stands for the above statement.

b) Solve the inequality to get a range for the weight of the sample packages.

a) distance from w to $500 \le 13$

$$|w - 500| \le 13$$

b)

Range: $[487, 513]$

Solve the inequalities. Write your solution in interval notation.

3. (5pts) $7 < 4 - 3x < 11$ $|-4$

$3 < -3x < 7$ $|\div -3$

$-1 > x > -\frac{7}{3}$

$\left(-\frac{7}{3}, -1\right)$

4. (7pts) $|x + 4| \geq 3$

$|x - (-4)| \geq 3$

dist from x to $-4 \geq 3$

$(-\infty, -7] \cup [-1, \sim)$

5. (7pts) Find the domain of the function $f(x) = \dfrac{\sqrt{3x - 5}}{x^2 - 3x - 4}$ in interval notation.

Must have: $3x - 5 \geq 0$

$3x \geq 5$

$x \geq \frac{5}{3}$

Can't have

$x^2 - 3x - 4 = 0$

$(x - 4)(x + 1) = 0$

$x = 4, -1$

$\left[\frac{5}{3}, 4\right) \cup (4, \infty)$

6. (7pts) Let $f(x) = \dfrac{x + 4}{5 - 2x}$. Find the following and simplify where appropriate:

a) $f(2) = \dfrac{2 + 4}{5 - 4}$

$= 6$

b) $f(-2x) = \dfrac{-2x + 4}{5 - 2(-2x)}$

$= \dfrac{-2x + 4}{5 + 4x}$

c) $f(5x - 1) = \dfrac{5x - 1 + 4}{5 - 2(5x - 1)} = \dfrac{5x + 3}{5 - 10x + 2}$

$= \dfrac{5x + 3}{-10x + 7}$

7. (8pts) In a certain state, the tax on taxable income is as follows:

If taxable income is	tax is
between 0 and $5,000	2% of the taxable income
more than $5,000, up to $20,000	$100 plus 4% of taxable income over $5,000
more than $20,000	$700 plus 6% of taxable income over $20,000.

Write the multi-part formula for the function $T(x)$ which represents the tax on taxable income of x dollars.

$$T(x) = \begin{cases} 0.02x & \text{if } 0 \leq x \leq 5000 \\ 100 + 0.04(x - 5000) & \text{if } 5000 < x \leq 20{,}000 \\ 700 + 0.06(x - 20{,}000) & \text{if } x > 20{,}000 \end{cases}$$