1. (2pts) Solve the equation: $-4(x+3) = 2x+1$

$$-4x-12 = 2x+1$$

$$-13 = 6x \qquad x = -\frac{13}{6}$$

2. (3pts) Solve for x: $ax - a^2 = 2ab - bx + b^2$
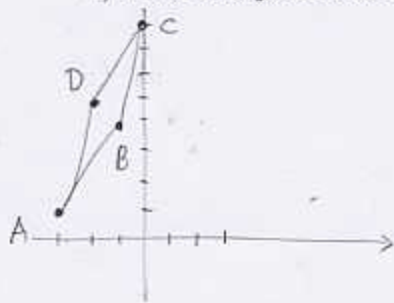
$$ax + bx = a^2 + 2ab + b^2$$

$$x(a+b) = (a+b)^2$$

$$x = \frac{(a+b)^2}{a+b} = a+b$$

3. (6pts) A quadrangle is a parallelogram if the midpoints of the opposite vertices are the same.
a) Use the above fact to see whether the quadrangle with vertices $A = (-3,1)$, $B = (1,4)$, $C = (0,8)$, $D = (2,5)$ is a parallelogram.
b) Find the perimeter of the quadrangle in a).

a) midpoint of AC is $M_1 = \left(\frac{-3+0}{2}, \frac{1+8}{2}\right) = \left(-\frac{3}{2}, \frac{9}{2}\right)$

midpoint of BD is $M_2 = \left(\frac{-1-2}{2}, \frac{4+5}{2}\right) = \left(-\frac{3}{2}, \frac{9}{2}\right)$

which is a parallelogram

b) In a parallelogram $d(A,B) = d(C,D)$ and $d(A,D) = d(B,C)$

So perimeter is $2\,d(A,B) + 2\,d(A,D) = 2\sqrt{13} + 2\sqrt{17}$

$$d(A,B) = \sqrt{(-1-(-3))^2 + (4-1)^2} = \sqrt{2^2 + 3^2} = \sqrt{13}$$

$$d(A,D) = \sqrt{(-2-(-3))^2 + (5-1)^2} = \sqrt{1^2 + 4^2} = \sqrt{17}$$

4. (7pts) Solve the following equations:

a) $x^2 = 2x + 24$

$$x^2 - 2x - 24 = 0$$
$$(x-6)(x+4) = 0$$
$$x = 6, -4$$

b) $x^2 - x = 6x - 20$

$$x^2 - 7x + 20 = 0$$
$$x = \frac{7 \pm \sqrt{(-7)^2 - 4 \cdot 1 \cdot 20}}{2 \cdot 1}$$
$$= \frac{7 \pm \sqrt{49 - 80}}{2} = \frac{7 \pm \sqrt{-31}}{2}$$

no real solution

5. (6pts) A 2-lb steak is to be divided among Jeff, Sybill and Christine according to how many buttons there are on their clothing (go figure!). Jeff is wearing 5 buttons, Sybill 6 and Christine 8 buttons, hence Jeff gets $\frac{5}{6}$ of what Sybill gets, and Sybill gets $\frac{6}{8}$ of what Christine gets. How many pounds of steak does each of them receive?

$x =$ lbs Christine gets

$\frac{6}{8} x =$ lbs Sybill gets

$\frac{5}{6} \cdot \frac{6}{8} x = \frac{5}{8} x =$ lbs Jeff gets

$$\frac{5}{8} x + \frac{6}{8} x + x = 2$$
$$x \left(\frac{5}{8} + \frac{6}{8} + \frac{8}{8} \right) = 2$$
$$x \cdot \frac{19}{8} = 2$$
$$x = \frac{16}{19}$$

Christine: $\frac{16}{19}$ lbs

Sybill: $\frac{6}{8} \cdot \frac{\cancel{16}^{2}}{19} = \frac{12}{19}$ lbs

Jeff: $\frac{5}{8} \cdot \frac{\cancel{16}^{2}}{19} = \frac{10}{19}$ lbs

6. (6pts) The height of a triangle is 3ft more than the base. What are the base and height if the area of the triangle is 40 square feet?

$A = \frac{1}{2} b \cdot h$

$40 = \frac{1}{2} b (b+3)$

$80 = b^2 + 3b$

$b^2 + 3b - 80 = 0$

$b = \frac{-3 \pm \sqrt{9 - 4(-80)}}{2} = \frac{-3 \pm \sqrt{329}}{2}$

$\frac{-3 - \sqrt{329}}{2}$ is negative, so only $\frac{-3 + \sqrt{329}}{2} \approx 7.57$ ft

is a solution