2.2 Homework solutions:

5&7: look in textbook for answers. Use the formula $(x-h)^2+(y-k)^2=r^2$ to find the equations. The point (h,k) is the center point.

Alternate version of the formula: $(x-x_1)^2+(y-y_1)^2=r^2$

13. The center is half way between (1,1) and (5,1) horizontally, so the center is (3,1).

The length from (1,1) to (5,1) is 4. That's the diameter. The radius is half of that, so r=2.

Plug in to get the center-radius form, and multiply out to get the general form:

$$(x-3)^2+(y-1)^2=2^2$$
$$x^2-3x-3x+9+y^2-y-y+1=4$$
$$x^2+y^2-6x-2y+9+1-4=0$$
$$x^2+y^2-6x-2y+6=0$$

15. The center of the circle is half way between (-4,2) and (0,2), so the center is (-2,2).

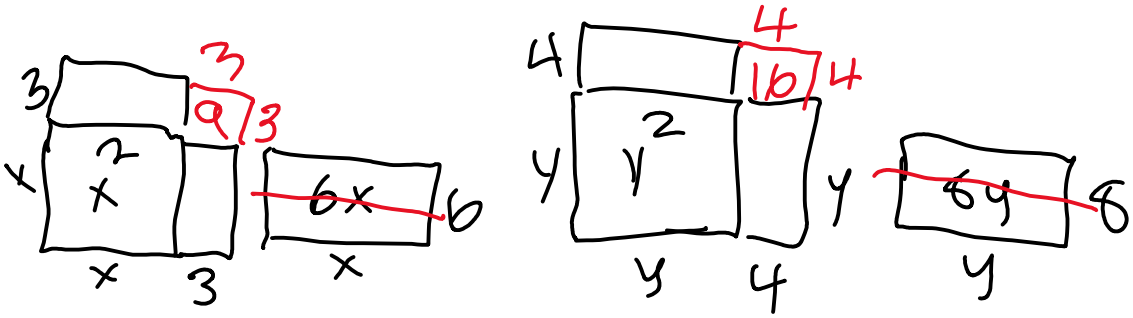
The diameter is the distance between (-4,2) and (0,2), so the diameter is 4 and the radius is 2:

$$(x+2)^2+(y-2)^2=2^2$$
$$x^2+2x+2x+4+y^2-2y-2y+4=4$$
$$x^2+4x+y^2-4y+4+4-4=0$$
$$x^2+y^2+4x-4y+4=0$$

19. Complete the square for x and y:

$$x^2 + y^2 + 6x + 8y + 9 = 0$$

$$x^2 + 6x \quad + y^2 + 8y \quad = -9$$



Visually, split up a $6 \times x$ rectangle into two $3 \times x$ rectangles, and you can add 3x3=9 to complete the square.

Similarly, split up an $8 \times x$ rectangle into two $4 \times x$ rectangles, and you can add 4x4=16 to complete the square.

Numerically, for something that starts $x^2 + bx$ you will need to take half of *b*, and square that number. Remember to add it to both sides.

Then the x's and y's will factor into perfect squares:

$$x^2 + 6x \quad +9 \quad + y^2 + 8y \; +16 \quad = -9 + 9 + 16$$

$$(x+3)(x+3) + (y+4)(y+4) = 16$$

$$(x+3)^2 + (y+4)^2 = 4^2$$

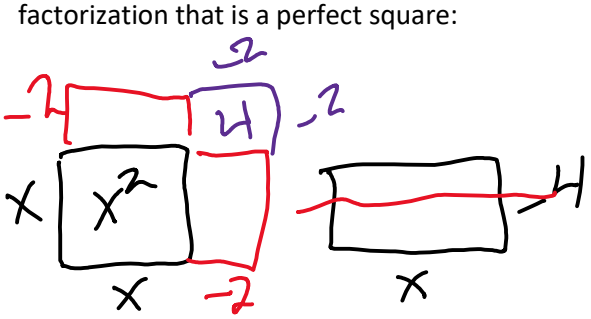
So the center is (-3,-4) and the radius is 4.

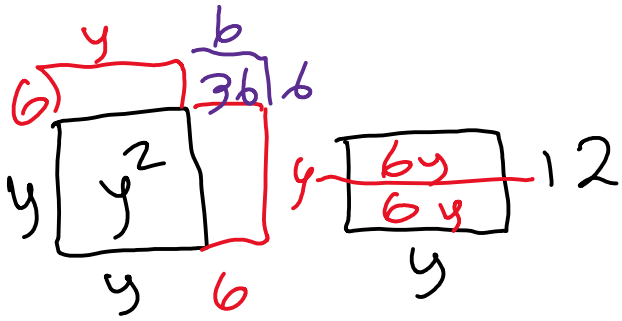
Note: one way to find the center is to solve $x + 3 = 0$ and $y + 4 = 0$ to get $x = -3$ and $y = -4$.

21.

$$x^2 + y^2 - 4x + 12y = -4$$
$$x^2 - 4x \quad + y^2 + 12y \quad = -4$$

Even though -4 isn't a sensible length, if we do the same thing as before, we will be able to get a factorization that is a perfect square:





$$x^2 - 4x \quad +4 \quad + y^2 + 12y \quad +36 \quad = -4 + 4 + 36$$
$$(x-2)(x-2) + (y+6)(y+6) = 36$$
$$(x-2)^2 + (y+6)^2 = 6^2$$

So the center is (2,-6) and the radius is 6.