Completing the Square Task

1. Explain in detail the process of completing the square for a quadratic equation.

Answers will vary

- get constant on opposite side
- make $a=1$ by dividing (factoring)
- add $\left(\frac{b}{2}\right)^2$ to both sides
- factor left side & simplify right
  use the trick
- Then if its asks to solve then solve using the square root method (don't forget + & −)

2. Can you always use "Completing the Square" when solving a quadratic?

Heck yes!

3. Solve the following using "Completing the Square"

a. $x^2-4x-10=0$

$+10 \qquad +10$

$x^2-4x=10$

$x^2-4x+\left(\frac{-4}{2}\right)^2=10+\left(\frac{-4}{2}\right)^2$

Factor using trick

$(x-2)^2=10+\frac{16}{4}$

$\sqrt{(x-2)^2}=\pm\sqrt{14}$

$x-2=\pm\sqrt{14}$ $\quad -2 \quad -2$

$x=-2\pm\sqrt{14}$

$\boxed{\{x \mid x=-2\pm\sqrt{14}\}}$

b. $x^2+5x+8=-3$

$-8 \qquad -8$

$x^2+5x=-11$

$x^2+5x+\left(\frac{5}{2}\right)^2=-11+\left(\frac{5}{2}\right)^2$

$\left(x+\frac{5}{2}\right)^2=-11+\frac{25}{4}$ so $\frac{-11\cdot 4}{1\cdot 4}+\frac{25}{4}$

$\sqrt{\left(x+\frac{5}{2}\right)^2}=\pm\sqrt{\frac{-69}{4}}$ since the $(\ )^2=-\#$ we will get imaginary numbers

$x+\frac{5}{2}=\pm\frac{\sqrt{69}\,i}{\sqrt{4}}$

$x+\frac{5}{2}=\pm\frac{\sqrt{69}\,i}{2}$ $\quad -5/2 \quad -5/2$

$x=-\frac{5}{2}\pm\frac{\sqrt{69}\,i}{2}$

$\boxed{\{x \mid x=-5/2\pm\frac{\sqrt{69}\,i}{2}\}}$

c. $2x^2-12x+4=18$

$-4 \qquad -4$

$\frac{2x^2}{2}-\frac{12x}{2}=\frac{14}{2}$

$x^2-6x=7$

$x^2-6x+\left(\frac{-6}{2}\right)^2=7+\left(\frac{-6}{2}\right)^2$ $\qquad \left(\frac{-6}{2}\right)^2=(-3)^2=9$

$(x-3)^2=7+9$

$\sqrt{(x-3)^2}=\pm\sqrt{16}$

$x-3=\pm4$ $\quad +3 \quad +3$

$x=7,-1$

$\boxed{\{x \mid x=-1,7\}}$

4. Solve for x by "Completing the Square" for the following equation: $ax^2+bx+c=0$

$-c \qquad -c$

$\frac{ax^2}{a}+\frac{bx}{a}=\frac{-c}{a}$

$x^2+\frac{b}{a}x=\frac{-c}{a}$ $\quad$ add $\left(\frac{b}{2}\right)^2$ where $b=\frac{b}{a}$ so $\frac{\frac{b}{a}}{2}\cdot\frac{1}{2}=\frac{b}{2a}$

$x^2+\frac{b}{a}x+\left(\frac{b}{2a}\right)^2=\frac{-c}{a}+\left(\frac{b}{2a}\right)^2$

combine add $\quad \frac{-c\cdot 4a}{a\cdot 4a}+\frac{b^2}{4a^2}=\frac{-4ac+b^2}{4a^2}$

$\left(x+\frac{b}{2a}\right)^2=\frac{-4ac+b^2}{4a^2}$

$\sqrt{\left(x+\frac{b}{2a}\right)^2}=\pm\sqrt{\frac{b^2-4ac}{4a^2}}$ → solve using square root method

$x+\frac{b}{2a}=\pm\frac{\sqrt{b^2-4ac}}{\sqrt{4a^2}}$

$x+\frac{b}{2a}=\pm\frac{\sqrt{b^2-4ac}}{2a}$ $\quad -b/2a \quad -b/2a$

$x=-\frac{b}{2a}\pm\frac{\sqrt{b^2-4ac}}{2a}$ same denominator so add fractions

$\boxed{x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}}$

5. Discuss your process and any findings from the last problem

The quadratic formula came from completing the square!

Cool beans :)

2.4- Circles

Standard form of a circle:

$$(x-h)^2+(y-k)^2=r^2$$

Ex. Write the standard form of the equation of the circle with radius 4 and center @ (-5, 3)

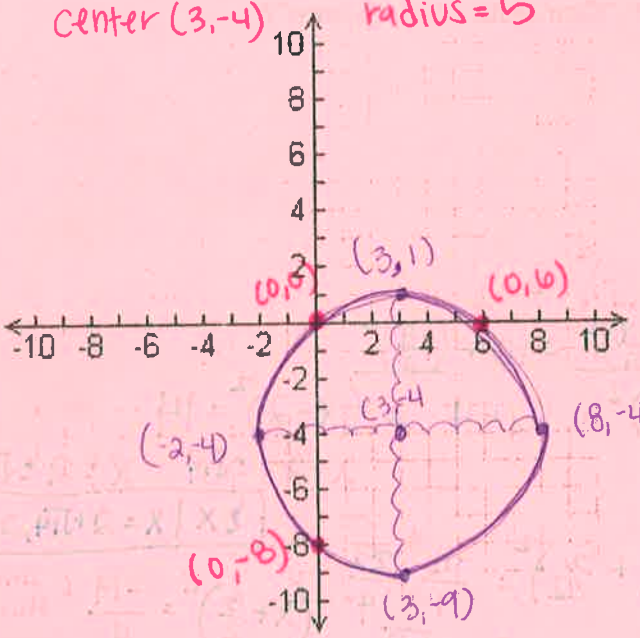
$$(x--5)^2+(y-3)^2=4^2$$

$$(x+5)^2+(y-3)^2=16$$

Graph the equation:

$(x-3)^2+(y+4)^2=25$

center (3,-4) radius = 5



Find the intercepts of the above circle (mathematically, not "ish"es)

x=0

$(x-3)^2+(y+4)^2=25$

$(0-3)^2+(y+4)^2=25$

$9+(y+4)^2=25$

$-9 \quad -9$

$\sqrt{(y+4)^2}=\sqrt{16}$

$y+4=\pm 4$

$y+4=4$, $-4 \; -4$, $y=0$

$y+4=-4$, $-4 \; -4$, $y=-8$

y intercepts

(0,0) (0,-8)

y=0

$(x-3)^2+(0+4)^2=25$

$(x-3)^2+16=25$

$-16 \quad -16$

$\sqrt{(x-3)^2}=\sqrt{9}$

$x-3=\pm 3$

$x-3=3$, $+3 \; +3$, $x=6$

$x-3=-3$, $+3 \; +3$, $x=0$

x intercepts

(6,0) (0,0)

General Form of a Circle:

$$x^2+y^2+ax+by+c=0$$

Write the equation of the previous circle in General Form:

$(x-3)^2+(y+4)^2=25$

$(x-3)(x-3)+(y+4)(y+4)=25$

$x^2-6x+9+y^2+8y+16=25$

$9+16=25$

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

What is the process for taking a General Form equation and making it into Standard Form:

Party!! Complete the Square!!

Take the General Equation above and now put it back into standard form.

$x^2-6x+\left(\frac{-6}{2}\right)^2+y^2+8y+\left(\frac{8}{2}\right)^2=0+\left(\frac{8}{2}\right)^2+\left(\frac{-6}{2}\right)^2$

$(x-3)^2+(y+4)^2=16+9$

$(x-3)^2+(y+4)^2=25$

Take this General Equation and put it into Standard Form. Find the intercepts and graph.

$x^2+y^2+4x-6y+12=0$

$-12 \quad -12$

$x^2+4x+\left(\frac{4}{2}\right)^2+y^2-6y+\left(\frac{-6}{2}\right)^2=-12+\left(\frac{4}{2}\right)^2+\left(\frac{-6}{2}\right)^2$

$(x+2)^2+(y-3)^2=-12+4+9$

$(x+2)^2+(y-3)^2=1$

center (-2,3)

r = 1

Ints: no intercepts.

since it equals a negative there are no intercepts