

Completing the square to solve a quadratic equation.

(ii) *Completing the Square.*
 $x^2 - 10x + 5 = 0$

$$x^2 - 10x = -5$$

\downarrow
 $\frac{10}{2} = 5 \rightarrow 5^2$ ← Keith

$$x^2 - 10x + 5^2 = -5 + 25$$

$$(x-5)^2 = 20$$

$$x-5 = \pm \sqrt{20} = \pm 2\sqrt{5}$$

$$x = 5 \pm 2\sqrt{5}$$

$$(x-3)^2 = x^2 - 6x + 9$$

\downarrow
 $\frac{6}{2} = 3 \rightarrow 3^2$

$$(x+6)^2 = x^2 + 12x + 36$$

\downarrow
 $\frac{12}{2} = 6 \rightarrow 6^2$

$$\begin{array}{r}
 2 \overline{) 20} \\
 \underline{2 \overline{) 10}} \\
 5 \\
 \sqrt{2 \cdot 2 \cdot 5} = \\
 2\sqrt{5}
 \end{array}$$

Completing the square to manipulate an expression/equation.

Recall. A circle of radius r centered at (h, k) has equation

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

Graph the circle

$$x^2 + y^2 + 6x + 4y + 9 = 0$$

$$x^2 + 6x \quad y^2 + 4y \quad = -9$$

$$x^2 + 6x + 3^2 + y^2 + 4y + 2^2 = -9 + 9 + 4$$

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

$$r=2, (h, k) = (-3, -2)$$

