QUADRATICS

Function

$f(x) = x+3$

$f(2) = 2+3$

$f(5) = 5+3$

equation

$x^2+3x+5 = 2$ $x = ?$

vs

$f(x) = x^2+3x+5$ } Not a function.

expression.

Quadratic expression.

Linear Expressions: $mx+b$

Quadratic " : ax^2+bx+c

Factorised Form

$(x+m)(x-m)$

E.g $(x+3)(x-5)$

Completed Square

$a(x-b)^2+c$

E.g $2(x-3)^2+4$

Quadric Formula

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

Express $2x^2+8x+12$ in the form $p(x+q)^2+r$

completing the square

$2(x^2+4x+6)$

$2\left(x^2+\underbrace{2\times x\times 2}_{2ab}+2^2+2^2+6\right)$

$2\left[(x+2)^2-2^2+6\right]$

$2\left[(x+2)^2+2\right]$

$2(x+2)^2+4$

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

$x^2+2\cdot x\cdot 3+3^2$

$=(x+3)^2$

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ax^2+bx+c

$2x^2+8x+12$

Step 1: Divide every term by a: and then multiply everything by a.

$2(x^2+4x+6)$

Half $4\rightarrow 2$

Add 2^2, Subtract 2^2

Step 2:

$2\left(x^2+4x+2^2-2^2+6\right)$

Step 3:

$2\left((x+2)^2-2^2+6\right)$

$2\left[(x+2)^2+2\right]$

$2(x+2)^2+4$

$3x^2 - 18x + 30 \rightarrow$ Complete square

$3(x^2 - 6x + 10) \rightarrow$ Step 1

$3(x^2 - 6x + 3^2 - 3^2 + 10) \rightarrow$ Step 2

$3((x-3)^2 - 3^2 + 10)$

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

$3(x-3)^2 + 3$

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1) Take 'a' common

2) Add middle term's half's square and subtract it again.

3) form $(\ )^2$ by looking at the terms.

$2x^2 - 10x + 5 \rightarrow$ Completing the square.

$2(x^2 - 5x + \frac{5}{2})$

$2(x^2 - 5x + (\frac{5}{2})^2 - (\frac{5}{2})^2 + \frac{5}{2})$

$2((x - \frac{5}{2})^2 - (\frac{5}{2})^2 + \frac{5}{2})$

$2[(x - \frac{5}{2})^2 - \frac{25}{4} + \frac{5}{2}]$ $= -\frac{15}{4}$

$2[(x - \frac{5}{2})^2 - \frac{15}{4}]$

$\boxed{2(x - \frac{5}{2})^2 - \frac{15}{2}}$

Homework:

Complete the squares for the following:

i) $x^2 - 6x + 6$

ii) $2x^2 - 16x - 4$