$ax^2+bx+c=0$

Yesterday we did the quadratic formula

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

$\left(\frac{b}{2a}\right)^2$ $\frac{b^2}{4a^2}$

$$ax^2+bx+c=0$$

$$ax^2+bx=-c$$

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

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

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

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

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

b^2-4ac is called the discriminant

if b^2-4ac is negative $\therefore$ no solution

if $b^2-4ac=0$ $\therefore$ 1 solution

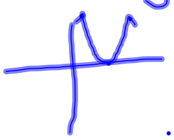
if b^2-4ac is positive $\therefore$ 2 answers

if b^2-4ac is perfect root (144) or 81 $\therefore$ 2 rational answers

Ex #1 How many roots in:

$$4x^2+8x+4=0$$

b^2-4ac $\quad 8^2-4\cdot4\cdot4$



$64-64=0$

$\therefore$ 1 root

$$\overset{a}{5x^2}+\overset{b}{8x}\overset{c}{-3}=0$$

$64 - {-120}$

184 $\quad 8^2-4(5)(-3)=184$ $\quad b^2-4ac$

$\therefore$ 2 roots

Find k so there is one real root

$$5x^2 + 20x + k = 0$$

$$b^2 - 4ac = 0$$

$$20^2 - 4 \cdot 5 \cdot k = 0$$

$$400 - 20k = 0$$

$$\frac{-20k}{-20} = \frac{-400}{-20} \qquad \boxed{k = 20}$$