Warm Up

Solve for x: **a** $3x^2 + 5x = 0$ **b** $x^2 = 5x + 6$

Solve for x: **a** $4x^2 + 1 = 4x$ **b** $6x^2 = 11x + 10$

Solve for x: $3x + \frac{2}{x} = -7$

Solve for exact values of x: $x^2 + 4x + 1 = 0$

Solve exactly for x: $-3x^2 + 12x + 5 = 0$

Solve for x: **a** $x^2 - 2x - 6 = 0$ **b** $2x^2 + 3x - 6 = 0$

In the quadratic formula, the quantity

$$b^2 - 4ac$$

under the square root sign is called the **discriminant.**

We use the symbol **delta** Δ to represent the discriminant, so, $\Delta = b^2 - 4ac$
The quadratic formula becomes:

$$x = \frac{-b \pm \sqrt{\Delta}}{2a}$$

- If $\Delta = 0$, $x = \dfrac{-b}{2a}$ is the **only solution** (a **repeated** or **double root**)
- If $\Delta > 0$, $\sqrt{\Delta}$ is a positive real number, so there are **two distinct real roots**

$$x = \frac{-b + \sqrt{\Delta}}{2a} \quad \text{and} \quad x = \frac{-b - \sqrt{\Delta}}{2a}$$

- If $\Delta < 0$, $\sqrt{\Delta}$ is not a real number and so there are **no real roots**.
- If a, b, and c are rational and Δ is a **square** then the equation has two rational roots which can be found by factorisation.

Use the discriminant to determine the nature of the roots of:

a $2x^2 - 2x + 3 = 0$

b $3x^2 - 4x - 2 = 0$

Consider $x^2 - 2x + m = 0$. Find the discriminant Δ, and hence find the values of m for which the equation has:

a a repeated root **b** 2 distinct real roots **c** no real roots.

For the equation $kx^2+(k+3)x=1$ find the discriminant Δ a
for it. Hence, find the value of k for which the equation has:

a two distinct real roots

b two real roots

c a repeated root

d no real roots.

Homework: Page 163 Problems 2-4 (ignore the "sign diagram" part)

2 By using the discriminant only, determine which of the following quadratic equations have rational roots which can be found by factorisation.

a $6x^2 - 5x - 6 = 0$ **b** $2x^2 - 7x - 5 = 0$ **c** $3x^2 + 4x + 1 = 0$

d $6x^2 - 47x - 8 = 0$ **e** $4x^2 - 3x + 2 = 0$ **f** $8x^2 + 2x - 3 = 0$

3 For the following quadratic equations, determine Δ in simplest form and draw a sign diagram for it. Hence find the value of m for which the equation has:

i a repeated root **ii** two distinct real roots **iii** no real roots.

a $x^2 + 4x + m = 0$ **b** $mx^2 + 3x + 2 = 0$ **c** $mx^2 - 3x + 1 = 0$

4 For the following quadratic equations, find the discriminant Δ and hence draw a sign diagram for it. Find all k values for which the equation has:

i two distinct real roots **ii** two real roots

iii a repeated root **iv** no real roots.

a $2x^2 + kx - k = 0$ **b** $kx^2 - 2x + k = 0$

c $x^2 + (k+2)x + 4 = 0$ **d** $2x^2 + (k-2)x + 2 = 0$

November 7, 2017

Warm Up

What is the discriminant of each equation and from that, what do you know about the roots?

1. $3x^2 + 5x - 6 = 0$

2. $5x - \frac{2}{x} = -4$

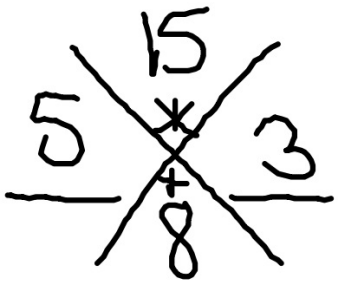
1. Find the discriminant
2. set it = to 0
3. solve
4. put answer(s) from #3 onto number line
5. test resulting intervals to see if they're positive or negative
6. determine the number of roots

General Form

$$y = 2x^2 + 16x + 30$$

By Factoring

1. Pull out a $2 \rightarrow 2(x^2 + 8x + 15)$



$y = 2(x+5)(x+3)$

$y = (2x+10)(x+3)$

$$y = 4x^2 - 40x + 84$$

1. Find the factored form of this equation
2. Find the vertex form of this equation
3. Solve for x
4. Draw a graph