The Discriminant.

Tuesday, October 8, 2019 8:40 AM

① $x^2 - 2x - 8 = 0$

$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(1)(-8)}}{2(1)}$$

$$x = \frac{2 \pm \sqrt{36}}{2}.$$

$$x = \frac{2+6}{2} = 4 \quad x = \frac{2-6}{2} = -2.$$

② $x^2 - 2x - 5 = 0$

$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(1)(-5)}}{2(1)}.$$

$$x = \frac{2 \pm \sqrt{24}}{2} = \frac{2 \pm 2\sqrt{6}}{2}$$

$$x = 1 \pm \sqrt{6}.$$

③ $x^2 - 6x + 9 = 0$

$$x = \frac{6 \pm \sqrt{(-6)^2 - 4(1)(9)}}{2(1)}.$$

$$x = \frac{6 \pm \sqrt{0}}{2} = \frac{6}{2} = 3$$

④ $x^2 - x + 4 = 0$

$$x = \frac{1 \pm \sqrt{(-1)^2 - 4(1)(4)}}{2(1)}.$$

$$x = \frac{1 \pm \sqrt{-15}}{2}.$$

no real roots.

The value inside the radical determines how many roots we get and what type of roots they are

The radicand is calculated by $\boxed{b^2 - 4ac}$. We call this the

discriminant

If $b^2 - 4ac < 0$ there are no real roots

If $b^2 - 4ac = 0$ there is one rational root (and $ax^2 + bx + c$ is a perfect square trinomial)

If $b^2 - 4ac > 0$ there are 2 roots
- the roots are rational if $b^2 - 4ac$ is a perfect square. This also means its factorable.

Eg Without solving determine how many roots $3x^2 - 7x + 5 = 0$ has.

$$b^2 - 4ac = (-7)^2 - 4(3)(5)$$
$$= 49 - 60$$
$$= -11 \quad \text{no real roots.}$$

Try: How many roots does $2x^2 + 3x - 5 = 0$ have?

$$b^2 - 4ac = 3^2 - 4(2)(-5)$$
$$= 9 + 40$$
$$= 49.$$

2 rational roots.

Determine the values for K for which $2x^2 - 3x + K = 0$ has 2 real roots.

$$b^2 - 4ac > 0$$
$$(-3)^2 - 4(2)K > 0$$
$$9 - 8K > 0$$
$$\frac{-8K}{-8} > \frac{-9}{-8}$$
$$K < \frac{9}{8}$$

Sample equation:

$$2x^2 - 3x - 5 = 0$$

Try: For what value of K would $3x^2 - 2x + K = 0$ have no real roots? Write a sample equation.

$$b^2 - 4ac < 0$$
$$(-2)^2 - 4(3)K < 0$$
$$4 - 12K < 0$$
$$\frac{-12K}{-12} < \frac{-4}{-12}$$

Sample:

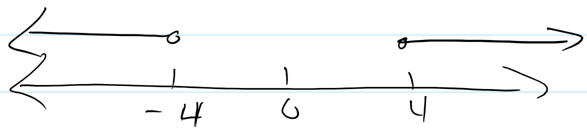
$$3x^2 - 2x + 1 = 0$$

$$\overline{-12} \quad \overline{-12}$$

$$k > \frac{1}{3}$$

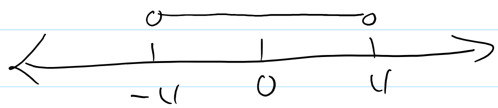
Try For what value of k will $x^2 + kx + 4 = 0$ have 2 real roots.

$$b^2 - 4ac > 0$$
$$k^2 - 4(1)(4) > 0$$
$$k^2 - 16 > 0$$
$$k^2 > 16$$



$k > 4$ or $k < -4$

no real roots? $k^2 < 16$ $\quad -4 < k < 4$



one real root? $k^2 = 16$ $\quad k = \pm 4$

Pg 251- 257 # 4 - 15