

Lesson 4.4.2

Saturday, February 4, 2017 4:44 PM

PREC 11

4.4 The Discriminant

The solution to any quadratic function $ax^2 + bx + c = 0$ can be found by applying the Quadratic Formula:

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

But sometimes it is more useful to determine how many solutions there will be instead of finding the actual numerical answers. To do this we use the discriminant.

The discriminant $b^2 - 4ac$ helps us determine the nature of the roots without actually knowing what they are.

If:	There are:
$b^2 - 4ac > 0$	2 different real roots
$b^2 - 4ac < 0$	no real roots
$b^2 - 4ac = 0$	one real roots

Example 1: Determine the nature of the roots of: $D = b^2 - 4ac$

- a. $3x^2 - 5x - 12 = 0$
- $a = 3$
 $b = -5$
 $c = -12$
- $$D = (-5)^2 - 4(3)(-12)$$
- $$= 25 + 144$$
- $$= 169$$
- \therefore 2 real roots
- b. $4x^2 - 20x + 25 = 0$
- $a = 4$
 $b = -20$
 $c = 25$
- $$D = (-20)^2 - 4(4)(25)$$
- $$= 400 - 400$$
- $$= 0$$
- \therefore one real roots
- c. $2x^2 - 6x + 7 = 0$
- $$D = (-6)^2 - 4(2)(7)$$
- $$= 36 - 56$$
- $$= -20$$
- \therefore No real roots

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 # 1, 2
 Do 'a, c' only

Example 2: For what values of k does $kx^2 - 3x + 2 = 0$:

a. have two different roots?

b. have two equal real roots?

c. have no real roots?

Example 3: Solve each of the following inequalities for x

a. $2x + 8 < 0$

b. $24 - 6x > 0$

c. $4k^2 - 40 > 0$

d. $25 - 5k^2 > 0$

Example 4: For what values of k does $-5x^2 - kx - 1 = 0$:

a. have two different roots?

b. have two equal real roots?

c. have no real roots?

Assignment: Discriminant Worksheet