Analytic Geometry **Quadratic Formula and Discriminant** Jan 26, 2015 (Mon)

* A **quadratic equation** is as an equation of degree 2, **meaning** that the highest exponent of this function is 2.

* The quadratic formula is used to solve an equation of the form $ax^2 + bx + c = 0$

*This formula can solve any equation that can be solved by factoring and completing the square

Quadratic Formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ given $ax^2 + bx + c = 0$

Solve for x below using quadratic formula

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

2. $x^2 + 24x = 4$

3. $2x^2 + 10 = x$

4. $2x^2 - 9 = 0$

The Discriminant is number (from the expression) inside the square root of the quadratic formula.

Since the quadratic formula is $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, the discriminant is the $\mathbf{b^2 - 4ac}$

The discriminant describes the **nature** , or the type, of solutions
If the Discriminant is **positive**, there are 2 real answers (2 real roots)
If the Discriminant is **negative**, there are 2 imaginary answers (2 imaginary roots)
If the Discriminant is **zero**, there is 1 real answer. (2 real answers being the same value) (1 real root)

Find the discriminant for the below and describe the type of roots for each equation:

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

6. $x^2 + 24x - 4 = 0$

7. $2x^2 - x + 10 = 0$

8. $2x^2 - 9 = 0$

a) Solve equation using quadratic formula b) find discriminant c) describe the nature of the roots

9. $2x^2 - 3x - 5 = 0$

10. $x^2 + 12x = 3$

11. $2x^2 + 9 = 3x$

12. $2x^2 - 7 = 0$

Quadratic Formula and Discriminant Day 1 Homework Jan 26, 2015 (Mon)

a) Solve equation using quadratic formula b) find discriminant c) describe the nature of the roots

1. $4x^2 - 11x = 3$

2. $x^2 + 7x = 5$

3. $5x^2 + 1 = 3x$

4. $5x^2 - 9 = 0$

a) Solve equation using quadratic formula b) find discriminant c) describe the nature of the roots

5. $-7 + 3x^2 = 4x$

6. $x^2 + 11x = -4$

7. $2x^2 + 13 = 5x$

8. $3x^2 - 17 = 0$

Analytic Geometry **Quadratic Formula and Discriminant** Jan 26, 2015 (Mon) Key

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Quadratic Formula: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ given $ax^2 + bx + c = 0$

Solve for x below using quadratic formula

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

$a=1$, $b=-5$, $c=6$

$\dfrac{5 \pm \sqrt{25-4(1)(6)}}{2(1)}$

$\dfrac{5 \pm \sqrt{1}}{2} = \dfrac{5+1}{2}, \dfrac{5-1}{2}$

$x = \dfrac{6}{2}, \dfrac{4}{2}$

$\boxed{x = 3, 2}$

2. $x^2 + 24x = 4$

$x^2+24x-4=0$

$a=1$, $b=24$, $c=-4$

$\dfrac{-24 \pm \sqrt{24^2-4(1)(-4)}}{2(1)}$

$\dfrac{-24 \pm \sqrt{592}}{2}$

$x = \dfrac{-24 \pm 4\sqrt{37}}{2}$ $\quad x = \dfrac{-24}{2} \pm \dfrac{4\sqrt{37}}{2} = \boxed{-12 \pm 2\sqrt{37}}$

3. $2x^2 + 10 = x$

$2x^2 - x + 10 = 0$

$\dfrac{1 \pm \sqrt{1^2-4(2)(10)}}{2(2)} = \dfrac{1 \pm \sqrt{-79}}{4}$

$\boxed{\dfrac{1 \pm i\sqrt{79}}{4}}$

4. $2x^2 - 9 = 0$

$x^2 = \dfrac{9}{2}$

$x = \pm \dfrac{3}{\sqrt{2}} \cdot \dfrac{\sqrt{2}}{\sqrt{2}} = \dfrac{3\sqrt{2}}{2}$

$a=2$, $b=0$, $c=-9$

$\dfrac{0 \pm \sqrt{0-4(2)(-9)}}{2(2)}$

$\dfrac{0 \pm \sqrt{72}}{4} = \dfrac{6\sqrt{2}}{4} = \dfrac{3\sqrt{2}}{2}$

$\boxed{x = \pm \dfrac{3\sqrt{2}}{2}}$

$x^2 - 6x + 9$ $6 \pm \sqrt{}$

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Find the discriminant for the below and describe the type of roots for each equation:

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

$b^2 - 4ac$

$5^2 - 4(1)(6)$

$25 - 24 = 1 > 0$

2 Real solutions

6. $x^2 + 24x - 4 = 0$

$24^2 - 4(1)(-4)$

$592 > 0$

2 Real solutions

7. $2x^2 - x + 10 = 0$

$1^2 - 4(2)(10)$

$-79 < 0$

2 imaginary roots

8. $2x^2 - 9 = 0$

$0 - 4(2)(-9)$

$72 > 0$

2 Real Roots

a) Solve equation using quadratic formula b) find discriminant c) describe the nature of the roots

9. $2x^2 - 3x - 5 = 0$

$\dfrac{3 \pm \sqrt{9 - 4(2)(-5)}}{2(2)} = \dfrac{3 \pm \sqrt{49}}{4}$

$\dfrac{3 \pm 7}{4}$ $\dfrac{10}{4}, \dfrac{-4}{4}$

$D = 49 > 0$
2 Reals

$\boxed{x = \dfrac{5}{2}, -1}$

10. $x^2 + 12x = 3$

$x^2 + 12x - 3 = 0$

$\dfrac{-12 \pm \sqrt{144 - 4(1)(-3)}}{2(1)}$

$\dfrac{-12 \pm \sqrt{156}}{2}$

$\dfrac{-12 \pm 2\sqrt{39}}{2}$ $\boxed{x = -6 \pm \sqrt{39}}$

$D = 156 > 0$
2 Real Roots

11. $2x^2 + 9 = 3x$

$2x^2 - 3x + 9 = 0$

$\dfrac{3 \pm \sqrt{9 - 4(2)(9)}}{2(2)}$

$\dfrac{3 \pm \sqrt{-63}}{4}$

$\boxed{x = \dfrac{3 \pm 3i\sqrt{7}}{4}}$

$D = -63 < 0$
2 Imaginary Roots

12. $2x^2 - 7 = 0$

$\dfrac{0 \pm \sqrt{0^2 - 4(2)(-7)}}{2(2)}$

$\pm \dfrac{\sqrt{56}}{4}$

$\dfrac{2\sqrt{14}}{4} = \pm \dfrac{\sqrt{14}}{2}$

$\boxed{x = \pm \dfrac{\sqrt{14}}{2}}$

$D = 56 > 0$
2 Reals

Quadratic Formula and Discriminant Day 1 Homework Jan 26, 2015 (Mon)

a) Solve equation using quadratic formula b) find discriminant c) describe the nature of the roots

1. $4x^2 - 11x = 3$

$4x^2-11x-3=0$

$\frac{11\pm\sqrt{121-4(4)(-3)}}{2(4)}=\frac{11\pm\sqrt{169}}{8}$

$\frac{11\pm13}{8}$ $\frac{11+13}{8}$, $\frac{11-13}{8}$

$\frac{24}{8}, \frac{-2}{8}$

$x=3, -1/4$

2. $x^2 + 7x = 5$

$x^2+7x-5=0$

$\frac{-7\pm\sqrt{49-4(1)(-5)}}{2(1)}$

$\frac{-7\pm\sqrt{69}}{2}$

$x=\frac{-7\pm\sqrt{69}}{2}$

3. $5x^2 + 1 = 3x$

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

$\frac{3\pm\sqrt{9-4(5)(1)}}{2(5)}$

$\frac{3\pm\sqrt{-11}}{10}$

$x=\frac{3\pm i\sqrt{11}}{10}$

4. $5x^2 - 9 = 0$

$\frac{0\pm\sqrt{0-4(5)(-9)}}{2(5)}$

$\frac{\pm\sqrt{180}}{10}$

$\frac{6\sqrt{5}}{10}$

$x=\frac{\pm 3\sqrt{5}}{5}$

a) Solve equation using quadratic formula b) find discriminant c) describe the nature of the roots

5. $-7 + 3x^2 = 4x$

$3x^2 - 4x - 7 = 0$

$\frac{4 \pm \sqrt{16 - 4(3)(-7)}}{2(3)}$ $\frac{4 \pm \sqrt{100}}{6}$

$\frac{4 \pm 10}{6}$ $x = \frac{14}{6}, \frac{-6}{6}$

$x = \frac{7}{3}, -1$

6. $x^2 + 11x = -4$

$x^2 + 11x + 4 = 0$

$\frac{-11 \pm \sqrt{121 - 4(1)(4)}}{2(1)}$

$x = \frac{-11 \pm \sqrt{105}}{2}$

7. $2x^2 + 13 = 5x$

$2x^2 - 5x + 13 = 0$

$\frac{5 \pm \sqrt{25 - 4(2)(13)}}{2(2)}$ $\frac{5 \pm \sqrt{-79}}{4}$

$x = \frac{5 \pm i\sqrt{79}}{4}$

8. $3x^2 - 17 = 0$

$\frac{0 \pm \sqrt{0^2 - 4(3)(-17)}}{2(3)} = \frac{\sqrt{204}}{6}$

$x = \frac{\pm 2\sqrt{51}}{6}$ $x = \pm \frac{\sqrt{51}}{3}$