Simplifying radicals
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Solving Quadratics Using the Quadratic Formula

Let $a,b,c \in R$ such that $a \neq 0$. The solutions of the quadratic equation $ax^2 + bx + c = 0$ are:

Quadratic Formula: $x = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$

*Use the Quadratic Formula to solve a quadratic equation when...

a quadratic equation is NOT factorable
or we cannot use square root method

ex: Solve.

a) $x^2 + x - 4 = 0$

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

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

$$x = \frac{-1 \pm \sqrt{1 + -16}}{2}$$

$$\boxed{x = \frac{-1 \pm \sqrt{17}}{2}}$$

b.) $x^2+2x+5=0$ $\sqrt{-1}=i$

$a=1$
$b=2$
$c=5$

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

$$x=\frac{-2\pm\sqrt{-16}}{2}=\frac{-2\pm i\sqrt{16}}{2}$$

$$x=\frac{-2\pm 4i}{2}=\frac{-2}{2}\pm\frac{4i}{2}=-1\pm 2i$$

c.) $2x^2 + 2x = 5 - 2x$

$+2x \qquad +2x$

$\sqrt{56} = \sqrt{4 \cdot 14} = 2\sqrt{14}$

$2x^2 + 4x - 5 = 0$

$a = 2$

$b = 4$

$c = -5$

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

$$x = \frac{-4 \pm \sqrt{16 + 40}}{4} = \frac{-4 \pm \sqrt{56}}{4}$$

$$x = \frac{-4 \pm 2\sqrt{14}}{4} = \frac{-4}{4} \pm \frac{2\sqrt{14}}{4} = -1 \pm \frac{\sqrt{14}}{2}$$

d.) $3x^2 + 4x + 2 = 0$

$\sqrt{-8} = i\sqrt{4 \cdot 2}$

$a = 3$

$b = 4$

$c = 2$

$$x = \frac{-4 \pm \sqrt{4^2 - 4(3)(2)}}{2(3)}$$

$16 - 24$

$$x = \frac{-4 \pm \sqrt{-8}}{6}$$

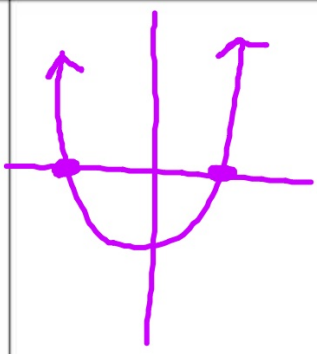
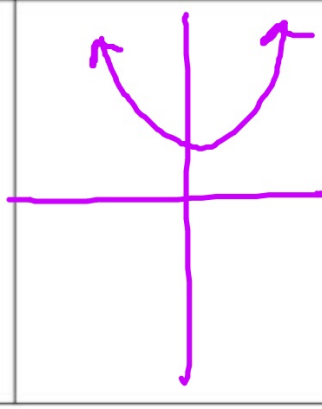
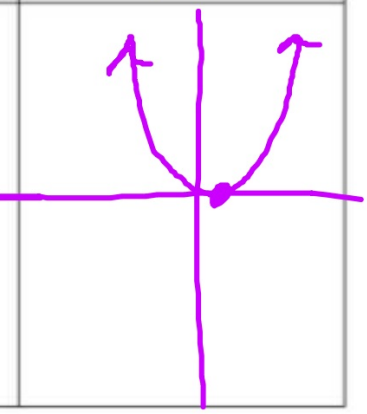
$$x = \frac{-4 \pm 2i\sqrt{2}}{6} = \frac{-4}{6} \pm \frac{2i\sqrt{2}}{6} = \frac{-2}{3} \pm \frac{i\sqrt{2}}{3}$$

The Discriminant:

- In the quadratic formula, the expression b^2-4ac is called the discriminant.

- The discriminant is used to determine the *types of solutions for the equation*.

Using The Discriminant:

Value of discriminant	$b^2-4ac>0$	$b^2-4ac<0$	$b^2-4ac=0$
Number of solutions	2	2	1 repeated
Type of solutions	real	imaginary	real
Graph of $y=ax^2+bx+c$			

ex: Find the discriminant and give the number and type of solutions of the equation.

a) $x^2 - 8x + 13 = -4$

$x^2 - 8x + 17 = 0$

$a = 1$

$b = -8$

$c = 17$

$b^2 - 4ac$

$(-8)^2 - 4(1)(17)$

$64 - 68$

-4

2 imaginary solutions

b) $x^2 - 8x + 16 = 0$

$a = 1$

$b = -8$

$c = 16$

$b^2 - 4ac$

$(-8)^2 - 4(1)(16)$

$64 - 64$

0

1 real solution

c) $8x^2 - 2x + 1 = x^2 + 6$

$-x^2 \quad -6 \quad -x^2 \quad -6$

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

$a = 7$

$b = -2$

$c = -5$

$(-2)^2 - 4(7)(-5)$

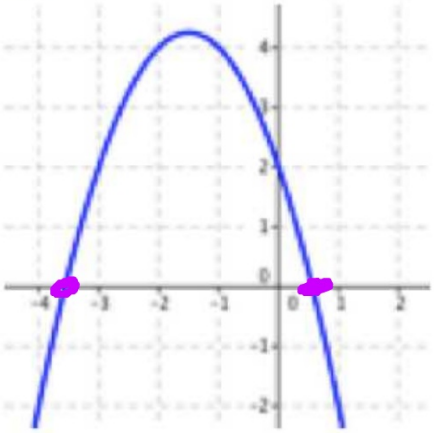
$4 + 140$

144

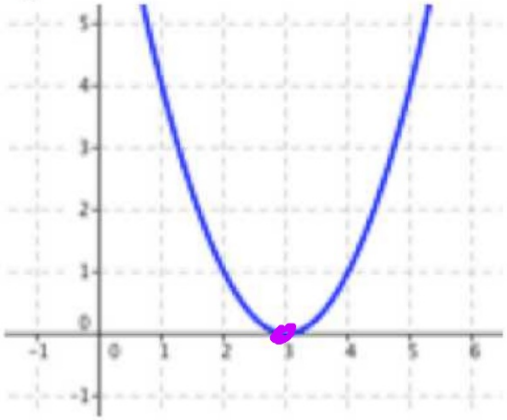
2 real

ex: The graph of $y = ax^2 + bx + c$ r the solutions of $ax^2 + bx + c = 0$ are given. Determine if the discriminant is positive, negative, or zero. Explain your reasoning.

a)



b)



zero

c) $x = 2 \pm 3i$

↑ imaginary

negative

Solve.

$x^2 - 3x - 18 = 0$

$(x-6)(x+3) = 0$

$x = 6, -3$

$3(x+2)^2 - 1 = 20$

$\sqrt{(x+2)^2} = \sqrt{7}$

$x + 2 = \pm\sqrt{7}$

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

Simplify

$3\sqrt{84} = 3\sqrt{4 \cdot 21}$

$= 6\sqrt{21}$

$(2+i)(3-4i)$

$6 - 8i + 3i - 4i^2$

$6 - 5i + 4 = 10 - 5i$