Complex Numbers

**Formula Sheet**

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| **Name** | **Definition** | **Formula** |
| Imaginary Unit | A number written as a multiple of the square root of negative one, represented by the letter $$i $$. | $$i=\sqrt{−1}$$$$i^{2}=−1$$ |
| Complex Numbers | A number consisting of a real and an imaginary component. | $$z=a+bi $$* $$z $$represents a complex number
* $$a $$represents the part of the complex number that is real
* $$bi $$represents the part of the complex number that is imaginary
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| Multiplication Property of Radicals | The square root of a product can be written as the product of individual roots of the factors. | $$\sqrt{ab}=\sqrt{a}⋅\sqrt{b}$$ |
| Complex Conjugate | If $$a+bi $$is a complex number, its conjugate is $$a−bi $$. | For example, the complex conjugate of $$4+3i $$is $$4−3i $$. |
| Quadratic Equation | An equation containing one term in which the unknown is squared and no term in which it is raised to a higher power. | $$ax^{2}+bx+c=0$$ |
| Quadratic Formula | The quadratic formula is a general formula for finding the solution to a quadratic equation. | $$x=\frac{−b\pm \sqrt{b^{2}−4ac}}{2a}$$where *a*, *b*, and *c* are the coefficients and constant of the terms in a quadratic equation $$ax^{2}+bx+c=0$$ |
| Discriminant | The portion of the quadratic formula that determines whether a quadratic equation has real solutions. | $$b^{2}−4ac$$* Positive number: two distinct real solutions
* Negative number no real solutions (imaginary or complex solutions)
* Zero: real repeated solutions
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| Associative Property | The way factors are grouped in a problem containing only addition and multiplication has no effect on the product. | Addition: $$a+\left(b+c\right)=\left(a+b\right)+c$$Multiplication:$$a⋅\left(b⋅c\right)=\left(a⋅b\right)⋅c$$ |
| Commutative Property | A property of algebra that states that the order in which algebraic terms are added or multiplied together does not affect the sum or product of those terms. | Addition: $$a+b=b+a $$Multiplication: $$ab=ba $$ |
| Distributive Property | A property of algebra states that multiplying the sum of two or more addends by a number will give the same result as multiplying each addend individually by the number and then adding the products together. | $$a\left(b+c\right)=ab+ac$$ |
| Fundamental Theorem of Algebra | The Fundamental Theorem of Algebra states that every polynomial equation with one variable has as many roots and solutions (including repeated solutions) as the highest exponent of one of its terms. | If $$P\left(x\right)$$ is a polynomial of degree $$n\geq 1 $$then $$P\left(x\right)=0$$ has exactly $$n $$ roots. |
| Zero Product Property of Multiplication | The Zero Product Property holds that if the product of two or more factors is zero, then at least one factor must be zero. | If $$ab=0 $$, then $$a=0, b=0,  $$or both $$a $$and $$b $$equal to zero. |