Polynomial Functions & Graphs

**Formula Sheet**

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| **Name** | **Definition** | **Formula** |
| Zero Product Property | 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. |
| Polynomial Identities | A polynomial equation that is always true for any value of the variables.  | Common Polynomial Identities:$$\left(a+b\right)^{2}=a^{2}+2ab+b^{2}$$$$\left(a−b\right)^{2}=a^{2}−2ab+b^{2}$$$$\left(a−b\right)\left(a+b\right)=a^{2}−b^{2}$$$$a^{3}+a^{3}=\left(a+b\right)\left(a^{2}−ab+b^{2}\right)$$$$a^{3}−a^{3}=\left(a−b\right)\left(a^{2}+ab+b^{2}\right)$$ |
| The Factor Theorem | The Factor Theorem links factors and zeros of polynomials. | If $$c $$is a zero of a polynomial, then $$x−c $$is a factor of that polynomial. |
| Odd Multiplicity and Graph Behavior | If a factor is raised to an oddexponent, the graph will cross the *x*-axis. |  |
| Even Multiplicity and Graph Behavior | If a factor is raised to an even exponent, the graph will touch the *x*-axis and turn back to the direction it came from. |  |
| Quadratic Formula | The quadratic formula is a general formula for finding the roots of 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 $$ax^{2}+bx+c$$ |
| Relative Extrema | The degree of a polynomial relates to the number of relative extrema that the graph of a polynomial will have.  |  |
| The Division Algorithm | The remainder is represented by adding it to the product of the quotient and divisor.  | $$p\left(x\right)=d\left(x\right)⋅q\left(x\right)+r\left(x\right)$$where* $$p\left(x\right)$$ = polynomial
* $$d\left(x\right)$$ = divisor
* $$q\left(x\right)$$ = quotient
* $$r\left(x\right)$$ = remainder
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| The Remainder Theorem | The Remainder Theorem states that the remainder of dividing a polynomial by a factor is the value of the polynomial at that factor. | The value of a function, $$f\left(x\right)$$, at a given value, $$x−a $$, then divide the polynomial by $$f\left(x\right)$$ by the linear function $$x−a $$. |
| Single Motion Projectile | The formula that models the motion of an object where $$s\left(t\right)$$ is height and $$t $$is time. | $$s\left(t\right)=\frac{1}{2}gt^{2}+v\_{0}t+s\_{0}$$where* $$g $$is the gravitational constant ($$g=−32 \frac{ft}{s^{2}}$$ or $$g=−9.8 \frac{m}{s^{2}}$$)
* $$v\_{0}$$ = initial velocity
* $$s\_{0}$$ = initial height
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