**Harold’s Parent Functions**

**“Cheat Sheet”**

AKA Library of Functions

18 September 2022

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| **Function Name** | **Parent Function** | **Graph** | **Characteristics** |
| **Algebra** | | | |
| **Constant** |  | https://encrypted-tbn0.google.com/images?q=tbn:ANd9GcReNbvhjoHbBc1qYK29zVgwzp22KttaNO5rdLcTV51vl92DLCqK | Domain: (∞, ∞)  Range: [c, c]  Inverse Function: Undefined (asymptote)  Restrictions: c is a real number  Odd/Even: Even  General Form: |
| **Linear**  **or**  **Identity** |  | https://encrypted-tbn0.google.com/images?q=tbn:ANd9GcS99vPnqum7SLUQ8rIt71HnriyFyWQrHdY1LVl7xGPXVYVhZODSjQ | Domain: (∞, ∞)  Range: (∞, ∞)  Inverse Function: Same as parent  Restrictions: m ≠ 0  Odd/Even: Odd  General Forms: |
| **Quadratic**  **or**  **Square** |  | https://encrypted-tbn3.google.com/images?q=tbn:ANd9GcRoxF8gygx2_CtyUlv0Vftl9AUp-1X7jCOSsbrFWG9HmMbLveruGg | Domain: (∞, ∞)  Range: [0, ∞)  Inverse Function:  Restrictions: None  Odd/Even: Even  General Form: |
| **Square Root** |  | https://encrypted-tbn0.google.com/images?q=tbn:ANd9GcS0C2HH9fCQADYdodgzOm-A8RasQ6HD0VBXhQi4nb6Jy50eu0ow | Domain: [0, ∞)  Range: [0, ∞)  Inverse Function:  Restrictions:  Odd/Even: Neither  General Form: |
| **Cubic** |  | https://encrypted-tbn1.google.com/images?q=tbn:ANd9GcRhj7LDRqaK071HwHCcjCi64RRSyQ0vzmOZUBa39825ggeqmYMj | Domain: (∞, ∞)  Range: (∞, ∞)  Inverse Function:  Restrictions: None  Odd/Even: Odd  General Form: |
| **Cube Root** |  | https://encrypted-tbn0.google.com/images?q=tbn:ANd9GcQBFomgqyx0JHRaOwh0vAiRFMZLV6n72snnLNel3lfJOZkxndRStA | Domain: (∞, ∞)  Range: (∞, ∞)  Inverse Function:  Restrictions: None  Odd/Even: Odd  General Form: |
| **Reciprocal**  **or**  **Rational** |  | http://upload.wikimedia.org/wikipedia/commons/thumb/4/43/Hyperbola_one_over_x.svg/300px-Hyperbola_one_over_x.svg.png | Domain: (∞, 0) (0, ∞)  Range: (∞, 0) (0, ∞)  Inverse Function: Same as parent  Restrictions: x ≠ 0  Odd/Even: Odd  General Form: |
| **Transcendentals** | | | |
| **Exponential** |  | http://upload.wikimedia.org/wikipedia/commons/thumb/c/c6/Exp.svg/200px-Exp.svg.png | Domain: (∞, ∞)  Range: (0, ∞)  Inverse Function:  Restrictions: None, x can be complex  Odd/Even: Neither  General Form: |
| **Logarithmic** |  | https://encrypted-tbn1.google.com/images?q=tbn:ANd9GcSzhMLHvPv5qnKvCvjGegxPVd6TSJxtWIO8b6vNX3ojeYqHcB-LFQ | Domain: (0, ∞)  Range: (∞, ∞)  Inverse Function:  Restrictions: x > 0  Odd/Even: Neither  General Form: |
| **Absolute Value** |  | http://upload.wikimedia.org/wikipedia/commons/thumb/6/6b/Absolute_value.svg/360px-Absolute_value.svg.png | Domain: (∞, ∞)  Range: [0, ∞)  Inverse Function:  Restrictions:  Odd/Even: Even  General Form: |
| **Greatest Integer**  **or**  **Floor** |  | http://upload.wikimedia.org/wikipedia/commons/thumb/e/e1/Floor_function.svg/200px-Floor_function.svg.png | Domain: (∞, ∞)  Range: (∞, ∞) whole numbers only  Inverse Function: Undefined (asymptotic)  Restrictions: Real numbers only  Odd/Even: Neither  General Form: |
| **Inverse Functions** |  | http://upload.wikimedia.org/wikipedia/commons/thumb/1/11/Inverse_Function_Graph.png/220px-Inverse_Function_Graph.png | Domain of x 🡪 Domain of y  Range of y 🡪 Range of x  Inverse Function: By definition  Restrictions: None  Odd/Even: Odd  General Form:  Algebraically: Swap , then solve for  Graphically: Rotate about 45⁰ line |
| **Conic Sections** | | | |
| **Parabola** |  | Parabola | Domain: (∞, ∞)  Range: or  Inverse Function:  Restrictions: None  Odd/Even: Even  Vertex :  Focus :  General Forms:  *where* |
| **Circle** |  | http://www.visionlearning.com/library/modules/mid131/Image/VLObject-2827-060131030112.jpg | Domain:  Range:  Inverse Function: Same as parent  Restrictions: None  Odd/Even: Both  Focus :  General Forms: |
| **Ellipse** |  | https://encrypted-tbn1.google.com/images?q=tbn:ANd9GcRywUZ086Na-CLQKtpfLSde9E2xrnWO-dw7JMw9pEqUVoLRP33iuw | Domain:  Range:  Inverse Function:  Restrictions: None  Odd/Even: Both  Foci :  General Forms:  *where* |
| **Hyperbola** |  | Hyperbola | Domain: (∞, *-a+h*] [*a+h*, ∞)  Range: (∞, ∞)  Inverse Function:  Restrictions: Domain is restricted  Odd/Even: Both  Foci :  General Forms:  *where* |

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| **Trigonometry** | | | | |
| **Sine** |  | https://encrypted-tbn2.google.com/images?q=tbn:ANd9GcS59mgvINMaLHQP_n6aBU7KCWCmfX28XZe-isPA8Wz2FAErtgvi | | Domain: (∞, ∞) with T = 2π/|b|  Range: [1, 1]  Inverse Function:  Restrictions: None  Odd/Even: Odd  General Form: |
| **Cosine** |  | https://encrypted-tbn0.google.com/images?q=tbn:ANd9GcTvW1VjiQQ_UHPBC7jeckN7puS4LQrJmZoF5LkYeq7Yj7S3_TtG | | Domain: (∞, ∞) with T = 2π/|b|  Range: [1, 1]  Inverse Function:  Restrictions: None  Odd/Even: Even  General Form: |
| **Tangent** |  | https://encrypted-tbn1.google.com/images?q=tbn:ANd9GcQGpcj4cHM6jdEtlClniUWqaMiuxhwh6GllnQAVFm8cvuirt21w | | Domain: (∞, ∞) except for  Range: (∞, ∞)  Inverse Function:  Restrictions: Asymptotes at  Odd/Even: Odd  General Form: |
| **Cosecant** |  | http://www.regentsprep.org/Regents/math/algtrig/ATT7/otherg2.gif | | Domain: (∞, ∞) except for  Range: (∞, -1] [1, ∞)  Inverse Function:  Restrictions: Range is bounded  Odd/Even: Odd  General Form: |
| **Secant** |  | http://www.regentsprep.org/Regents/math/algtrig/ATT7/otherg7.gif | | Domain: (∞, ∞) except for  Range: (∞,1] [1, ∞)  Inverse Function:  Restrictions: Range is bounded  Odd/Even: Even  General Form: |
| **Cotangent** |  | http://www.regentsprep.org/Regents/math/algtrig/ATT7/otherg94.gif | | Domain: (∞, ∞) except for  Range: (∞, ∞)  Inverse Function:  Restrictions: Asymptotes at x =  Odd/Even: Odd  General Form: |
| **Arcsine** |  | http://www.phengkimving.com/calc_of_one_real_var/06_the_trig_func_and_their_inv/06_02_the_inv_trig_func/06_02_01_the_inv_trig_func_files/image028.gif | | Domain: [1, 1]  Range: or Quadrants I & IV  Inverse Function:  Restrictions: Range & Domain are bounded  Odd/Even: Odd  General Form: |
| **Arccosine** |  | http://www.phengkimving.com/calc_of_one_real_var/06_the_trig_func_and_their_inv/06_02_the_inv_trig_func/06_02_01_the_inv_trig_func_files/image046.gif | | Domain: [1, 1]  Range: or Quadrants I & II  Inverse Function:  Restrictions: Range & Domain are bounded  Odd/Even: None  General Form: |
| **Arctangent** |  | http://www.phengkimving.com/calc_of_one_real_var/06_the_trig_func_and_their_inv/06_02_the_inv_trig_func/06_02_01_the_inv_trig_func_files/image063.gif | | Domain: (∞, ∞)  Range: or Quadrants I & IV  Inverse Function:  Restrictions: Range is bounded  Odd/Even: Odd  General Form: |
| **Arccosecant** |  | http://www.phengkimving.com/calc_of_one_real_var/06_the_trig_func_and_their_inv/06_02_the_inv_trig_func/06_02_01_the_inv_trig_func_files/image117.gif | | Domain: (∞,1] [1, ∞)  Range: or Quadrants I & IV  Inverse Function:  Restrictions: Range & Domain are bounded  Odd/Even: Odd  General Form: |
| **Arcsecant** |  | http://www.phengkimving.com/calc_of_one_real_var/06_the_trig_func_and_their_inv/06_02_the_inv_trig_func/06_02_01_the_inv_trig_func_files/image099.gif | | Domain: (∞,1] [1, ∞)  Range: ( or Quadrants I & II  Inverse Function:  Restrictions: Range & Domain are bounded  Odd/Even: Neither  General Form: |
| **Arccotangent** |  | http://www.phengkimving.com/calc_of_one_real_var/06_the_trig_func_and_their_inv/06_02_the_inv_trig_func/06_02_01_the_inv_trig_func_files/image081.gif | | Domain: (∞, ∞)  Range: or Quadrants I & II  Inverse Function:  Restrictions: Range is bounded  Odd/Even: Neither  General Form: |
| **Hyperbolics** | | | | |
| **Hyperbolic Sine** |  | | http://www.efunda.com/math/hyperbolic/images/sinh_plot.gif | Domain: (∞, ∞)  Range: (∞, ∞)  Inverse Function:  Restrictions: None  Odd/Even: Odd  General Form: |
| **Hyperbolic Cosine** |  | | http://www.efunda.com/math/hyperbolic/images/cosh_plot.gif | Domain: (∞, ∞)  Range: [1, ∞)  Inverse Function:  Restrictions: None  Odd/Even: Even  General Form: |
| **Hyperbolic Tangent** |  | | http://mathworld.wolfram.com/images/interactive/TanhReal.gif | Domain: (∞, ∞)  Range: (1, 1)  Inverse Function:  Restrictions: Asymptotes at  Odd/Even: Odd  General Form: |
| **Hyperbolic Cosecant** |  | | http://www.efunda.com/math/hyperbolic/images/csch_plot.gif | Domain: (∞, 0) (0, ∞)  Range: (∞, 0] [0, ∞)  Inverse Function:  Restrictions: Asymptotes at  Odd/Even: Odd  General Form: |
| **Hyperbolic Secant** |  | | http://mathworld.wolfram.com/images/interactive/SechReal.gif | Domain: (∞, ∞)  Range: (0, 1]  Inverse Function:  Restrictions: Asymptote at  Odd/Even: Even  General Form: |
| **Hyperbolic Cotangent** |  | | http://www.efunda.com/math/hyperbolic/images/coth_plot.gif | Domain: (∞, 0) (0, ∞)  Range: (∞, 1) (1, ∞)  Inverse Function:  Restrictions: Asymptotes at  Odd/Even: Odd  General Form: |
| **Hyperbolic Arcsine** |  | | http://www.efunda.com/math/hyperbolic/images/arcsinh_plot.gif | Domain: (∞, ∞)  Range: (∞, ∞)  Inverse Function:  Restrictions: None  Odd/Even: Odd  General Form: |
| **Hyperbolic Arccosine** |  | | http://www.efunda.com/math/hyperbolic/images/arccosh_plot.gif | Domain: [1, ∞)  Range: [0, ∞)  Inverse Function:  Restrictions:  Odd/Even: Neither  General Form: |
| **Hyperbolic Arctangent** |  | | http://www.efunda.com/math/hyperbolic/images/arctanh_plot.gif | Domain: (1, 1)  Range: (∞, ∞)  Inverse Function:  Restrictions: Asymptotes at  Odd/Even: Odd  General Form: |
| **Hyperbolic Arccosecant** |  | | http://www.efunda.com/math/hyperbolic/images/arccsch_plot.gif | Domain: (∞, 0) (0, ∞)  Range: (∞, 0] [0, ∞)  Inverse Function:  Restrictions: Asymptotes at  Odd/Even: Odd  General Form: |
| **Hyperbolic Arcsecant** |  | | http://www.efunda.com/math/hyperbolic/images/arcsech_plot.gif | Domain: (0, 1]  Range: [0, ∞)  Inverse Function:  Restrictions:  Odd/Even: Neither  General Form: |
| **Hyperbolic Arccotangent** |  | | http://www.efunda.com/math/hyperbolic/images/arccoth_plot.gif | Domain:  Range:  Inverse Function:  Restrictions: Asymptotes at  Odd/Even: Odd  General Form: |

**Graphing Tips**

**All Functions**

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| **The Seven Function “Levers”** | ***y = a f (b (x - h)) + k*** | **Graphing Tips** |
| 1. Move up/down ↕ | k (Vertical translation) | “+” Moves it up |
| 1. Move left/right ↔ | h (Horizontal translation) | “+“ Moves it right |
| 1. Stretch up/down ↕ | a (Vertical dilation) | Larger stretches it taller or makes it grow faster |
| 1. Stretch left/right ↔ | b (Horizontal dilation) | Larger stretches it out wider |
| 1. Flip about x-axis ⭮ | a → a | *→*  If then “odd” function |
| 1. Flip about y-axis ⭯ | b → b | *→*  If then “even” function |
| 1. Rotate CW/CCW ⭯ |  | “+” rotates CCW  For conic sections, where: |

**Trigonometric Functions f(x) = a <trig> (b (x - h)) + k**

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| **The Six Trig “Levers”** | ***y = a sin (b (x - h)) + k*** | **Graphing Tips** | **Notes** |
| 1. Move up/down ↕ | k (Vertical translation) |  | If then x-axis is replaced by -axis |
| 1. Move left/right ↔ | h (Phase shift) | ‘+‘ shifts right |  |
| 1. Stretch up/down ↕ | a (Amplitude) |  | a is NOT peak-to-peak on y-axis |
| 1. Stretch left/right ↔ | b (Frequency 2) |  | T = peak-to-peak on -axis  for |
| 1. Flip about y-axis ⭯ | b → b | → | Even Function: |
| 1. Flip about x-axis ⭮ | a → a | → | Odd Function: |