Author: *John J Weber III, PhD*

1.1 *Mathematica*

1.1.1 Grouping Symbols

There are at least three different grouping symbols:

- [ ], used for arguments of built-in *Mathematica* functions **only**.
- { }, used for grouping related mathematical items, for example:
  - domain; $\{x, -10, 10\}$
  - multiple functions; $\{x, x^2, \sqrt{x}\}$
  - (x, y) points; $\{3, -2\}$
  - lists; $\{2, 4, 6, 8, 10\}$
  - etc.
- ( ), used for grouping expressions, for example
  - E^(2x)
  - $x^2(x + 3)$
  - $1/(x^2 - x - 1)$
  - etc.

1.1.2 Trigonometric Functions

- $\sin(x)$ where x is in radians: Sin[x]
- $\sin(x)$ where x is in degrees: Sin[x Degree]
- $\cos(x)$ where x is in radians: Cos[x]
- $\cos(x)$ where x is in degrees: Cos[x Degree]
- $\tan(x)$ where x is in radians: Tan[x]
- $\tan(x)$ where x is in degrees: Tan[x Degree]
- $\csc(x)$ where x is in radians: Csc[x]
- $\csc(x)$ where x is in degrees: Csc[x Degree]
- $\sec(x)$ where x is in radians: Sec[x]
- $\sec(x)$ where x is in degrees: Sec[x Degree]

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- $\cot(x)$ where x is in radians: Cot[x]
- $\cot(x)$ where x is in degrees: Cot[x Degree]
- $\sin^{-1}(x)$ in radians: ArcSin[x]
- $\sin^{-1}(x)$ in degrees: N[ArcSin[x]/Degree]
- $\cos^{-1}(x)$ in radians: ArcCos[x]
- $\cos^{-1}(x)$ in degrees: N[ArcCos[x]/Degree]
- $\tan^{-1}(x)$ in radians: ArcTan[x]
- $\tan^{-1}(x)$ in degrees: N[ArcTan[x]/Degree]
- To raise a trig function to a power, e.g., $\sin^2(x)$: Sin[x]^2
- π: Pi

1.1.3 Hyperbolic Functions

- $\sinh(x)$: Sinh[x]
- $\cosh(x)$: Cosh[x]
- $\tanh(x)$: Tanh[x]
- $\operatorname{csch}(x)$: Csch[x]
- $\operatorname{sech}(x)$: Sech[x]
- $\coth(x)$: Coth[x]
- $\sinh^{-1}(x)$: ArcSinh[x]
- $\cosh^{-1}(x)$: ArcCosh[x]
- $\tanh^{-1}(x)$: ArcTanh[x]
- e: E

1.1.4 Logarithmic Functions

- $\ln(x)$: Log[x]
- $\log_b(x)$: Log[b,x], where $b > 0$, $b \neq 1$
- e^x: Exp[x] or E^x

1.1.5 Radical Functions

- $\sqrt{x}$: Sqrt[x]
- $\sqrt[n]{x}$: Surd[x,n]

1.1.6 Absolute Value Functions

- $|x|$: Abs[x]

1.2 *Matlab* and *Octave*

1.2.1 Trigonometric Functions

- $\sin(x)$ where x is in radians: sin(x)
- $\sin(x)$ where x is in degrees: sind(x)
- $\cos(x)$ where x is in radians: cos(x)
- $\cos(x)$ where x is in degrees: cosd(x)
- $\tan(x)$ where x is in radians: tan(x)
- $\tan(x)$ where x is in degrees: tand(x)
- $\csc(x)$ where x is in radians: csc(x)
- $\csc(x)$ where x is in degrees: cscd(x)
- $\sec(x)$ where x is in radians: sec(x)
- $\sec(x)$ where x is in degrees: secd(x)
- $\cot(x)$ where x is in radians: cot(x)
- $\cot(x)$ where x is in degrees: cotd(x)
- $\sin^{-1}(x)$ in radians: asin(x)
- $\sin^{-1}(x)$ in degrees: asind(x)
- $\cos^{-1}(x)$ in radians: acos(x)
- $\cos^{-1}(x)$ in degrees: acosd(x)
- $\tan^{-1}(x)$ in radians: atan(x)
- $\tan^{-1}(x)$ in degrees: atand(x)
- $\tan^{-1}\left(\frac{y}{x}\right)$ in radians: atan2(y,x)
- $\tan^{-1}\left(\frac{y}{x}\right)$ in degrees: atan2d(y,x)
- To raise a trig function to a power, e.g., $\sin^2(x)$: sin(x)^2
- To find hypotenuse of a right triangle with sides A and B: hypot(A,B)
- To convert $d°$ to radians: deg2rad(d)
- To convert radians, r, to degrees: rad2deg(r)
- π: pi()

1.2.2 Hyperbolic Functions

- $\sinh(x)$: sinh(x)
- $\cosh(x)$: cosh(x)
- $\tanh(x)$: tanh(x)
- $\operatorname{csch}(x)$: csch(x)
- $\operatorname{sech}(x)$: sech(x)
- $\coth(x)$: coth(x)
- $\sinh^{-1}(x)$: asinh(x)
- $\cosh^{-1}(x)$: acosh(x)
- $\tanh^{-1}(x)$: atanh(x)
- e: exp(1)

1.2.3 Logarithmic Functions

- $\ln(x)$: log(x)
- $\log_{10}(x)$: log10(x)
- $\log_2(x)$: log2(x)
- e^x: exp(x)

1.2.4 Radical Functions

- $\sqrt{x}$: sqrt(x)
- $\sqrt[n]{x}$: nthroot(x,n)

1.2.5 Absolute Value Functions

- $|x|$: abs(x)

1.3 *R*

1.3.1 Trigonometric Functions

- $\sin(x)$ where x is in radians: sin(x)
- $\cos(x)$ where x is in radians: cos(x)
- $\tan(x)$ where x is in radians: tan(x)
- $\csc(x)$ where x is in radians: csc(x)
- $\sec(x)$ where x is in radians: sec(x)
- $\cot(x)$ where x is in radians: cot(x)
- $\sin^{-1}(x)$ in radians: asin(x)
- $\cos^{-1}(x)$ in radians: acos(x)
- $\tan^{-1}(x)$ in radians: atan(x)
- $\tan^{-1}\left(\frac{y}{x}\right)$ in radians: atan2(y,x)
- To raise a trig function to a power, e.g., $\sin^2(x)$: sin(x)^2
- π: pi

1.3.2 Hyperbolic Functions

- $\sinh(x)$: sinh(x)
- $\cosh(x)$: cosh(x)
- $\tanh(x)$: tanh(x)
- $\sinh^{-1}(x)$: asinh(x)
- $\cosh^{-1}(x)$: acosh(x)
- $\tanh^{-1}(x)$: atanh(x)
- e: exp(1)

1.3.3 Logarithmic Functions

- $\ln(x)$: log(x)
- $\log_{10}(x)$: log10(x)
- $\log_2(x)$: log2(x)
- $\log_b(x)$: log(x,b)
- e^x: exp(x)

1.3.4 Radical Functions

- $\sqrt{x}$: sqrt(x)
- $\sqrt[n]{x}$: x^(1/n)

1.3.5 Absolute Value Functions

- $|x|$: abs(x)

1.4 *Python* 2.7.x

1.4.1 Trigonometric Functions

- $\sin(x)$ where x is in radians:
  from math import sin
  sin(x)
- $\cos(x)$ where x is in radians:
  from math import cos
  cos(x)
- $\tan(x)$ where x is in radians:
  from math import tan
  tan(x)
- $\sin^{-1}(x)$ in radians:
  from math import asin
  asin(x)
- $\cos^{-1}(x)$ in radians:
  from math import acos
  acos(x)
- $\tan^{-1}(x)$ in radians:
  from math import atan
  atan(x)
- $\tan^{-1}\left(\frac{y}{x}\right)$ in radians:
  from math import atan2
  atan2(x)
- To raise a trig function to a power, e.g., $\sin^2(x)$: sin(x)^2
- To find hypotenuse of a right triangle with sides x and y:
  from math import hypot
  hypot(x,y)
- π:
  from math import pi
  pi
- To convert from degrees to radians:
  from math import radians
  radians(x)
- To convert from radians to degrees:
  from math import degrees
  degrees(x)

1.4.2 Hyperbolic Functions

- $\sinh(x)$:
  from math import sinh
  sinh(x)
- $\cosh(x)$:
  from math import cosh
  cosh(x)
- $\tanh(x)$:
  from math import tanh
  tanh(x)
- $\sinh^{-1}(x)$:
  from math import asinh
  asinh(x)
- $\cosh^{-1}(x)$:
  from math import acosh
  acosh(x)
- $\tanh^{-1}(x)$:
  from math import atanh
  atanh(x)
- e:
  from math import e
  e

1.4.3 Logarithmic Functions

- $\ln(x)$:
  from math import log
  log(x)
- $\log_{10}(x)$:
  from math import log10
  log(x)
- $\log_b(x)$:
  from math import log
  log(x,b)
- e^x:
  from math import exp
  exp(x)

1.4.4 Radical Functions

- $\sqrt{x}$:
  from math import sqrt
  sqrt(x)
- $\sqrt[n]{x}$: x**(1./n)

1.4.5 Absolute Value Functions

- $|x|$: abs(x)

1.5 *Sagemath*

These functions return exact values. For decimal approximations, append .n(). For example sin(1).n()

1.5.1 Trigonometric Functions

- $\sin(x)$ where x is in radians: sin(x)
- $\cos(x)$ where x is in radians: cos(x)
- $\tan(x)$ where x is in radians: tan(x)
- $\csc(x)$ where x is in radians: csc(x)
- $\sec(x)$ where x is in radians: sec(x)
- $\cot(x)$ where x is in radians: cot(x)
- $\sin^{-1}(x)$ in radians: arcsin(x)
- $\cos^{-1}(x)$ in radians: arccos(x)
- $\tan^{-1}(x)$ in radians: arctan(x)
- $\csc^{-1}(x)$ in radians: arccsc(x)
- $\sec^{-1}(x)$ in radians: arcsec(x)
- $\cot^{-1}(x)$ in radians: arccot(x)
- $\tan^{-1}\left(\frac{y}{x}\right)$ in radians: arctan2(y,x)
- To raise a trig function to a power, e.g., $\sin^2(x)$: sin(x)^2
- π: pi

1.5.2 Hyperbolic Functions

- $\sinh(x)$: sinh(x)
- $\cosh(x)$: cosh(x)
- $\tanh(x)$: tanh(x)
- $\operatorname{csch}(x)$: csch(x)
- $\operatorname{sech}(x)$: sech(x)
- $\coth(x)$: coth(x)
- $\sinh^{-1}(x)$: arcsinh(x)

- $\cosh^{-1}(x)$: arccosh(x)
- $\tanh^{-1}(x)$: arctanh(x)
- e: exp(1)

1.5.3 Logarithmic Functions

- $\ln(x)$: ln(x)
- $\log_{10}(x)$: ln(x)/ln(10)
- $\log_b(x)$: ln(x)/ln(b)
- e^x: exp(x)

1.5.4 Radical Functions

- $\sqrt{x}$: sqrt(x)
- $\sqrt[n]{x}$: x^(1/n)

1.5.5 Absolute Value Functions

- $|x|$: abs(x)

1.6 *wxMaxima*

1.6.1 Trigonometric Functions

- $\sin(x)$ where x is in radians: sin(x)
- $\sin(x)$ where x is in degrees: sin(x*pi/180)
- $\cos(x)$ where x is in radians: cos(x)
- $\cos(x)$ where x is in degrees: cos(x*pi/180)
- $\tan(x)$ where x is in radians: tan(x)
- $\tan(x)$ where x is in degrees: tan(x*pi/180)
- $\csc(x)$ where x is in radians: csc(x)
- $\csc(x)$ where x is in degrees: csc(x*pi/180)
- $\sec(x)$ where x is in radians: sec(x)
- $\sec(x)$ where x is in degrees: sec(x*pi/180)
- $\cot(x)$ where x is in radians: cot(x)
- $\cot(x)$ where x is in degrees: cot(x*pi/180)
- $\sin^{-1}(x)$ in radians: asin(x)
- $\sin^{-1}(x)$ in degrees: asin(x)*180/pi
- $\cos^{-1}(x)$ in radians: acos[x]
- $\cos^{-1}(x)$ in degrees: acos(x)*180/pi
- $\tan^{-1}(x)$ in radians: atan[x]
- $\tan^{-1}(x)$ in degrees: atan(x)*180/pi
- To raise a trig function to a power, e.g., $\sin^2(x)$: sin(x)^2
- π: pi

1.6.2 Hyperbolic Functions

- $\sinh(x)$: sinh(x)
- $\cosh(x)$: cosh(x)
- $\tanh(x)$: tanh(x)
- $\sinh^{-1}(x)$: asinh(x)
- $\cosh^{-1}(x)$: acosh(x)
- $\tanh^{-1}(x)$: atanh(x)
- e: e

1.6.3 Logarithmic Functions

- $\ln(x)$: log(x)
- $\log_b(x)$: log(x)/log(b), where $b > 0$, $b \neq 1$
- e^x: exp^(x)

1.6.4 Radical Functions

- $\sqrt{x}$: sqrt(x)

1.6.5 Absolute Value Functions

- $|x|$: abs(x)