

# A Sample Document Using glossaries.sty

Nicola Talbot

June 1, 2018

## **Abstract**

This is a sample document illustrating the use of the **glossaries** package. The functions here have been taken from “Tables of Integrals, Series, and Products” by I.S. Gradshteyn and I.M Ryzhik. The glossary is a list of special functions, so the equation number has been used rather than the page number. This can be done using the **counter=equation** package option.

# Index of Special Functions and Notations

Notation	Function Name	Number of Formula
$B(x, y)$	Beta function	3.1–3.3
$B_x(p, q)$	Incomplete beta function	3.4
$C$	Euler's constant	9.1
$D_p(z)$	Parabolic cylinder functions	7.1
$\operatorname{erf}(x)$	Error function	2.1
$\operatorname{erfc}$	Complementary error function	2.2
$F(\phi, k)$	Elliptical integral of the first kind	8.1
$G$	Catalan's constant	9.2
$\Gamma(z)$	Gamma function	1.1, 1.2, 1.5
$\gamma(\alpha, x)$	Incomplete gamma function	1.3
$\Gamma(\alpha, x)$	Incomplete gamma function	1.4
$H_n(x)$	Hermite polynomials	4.3
$k_\nu(x)$	Bateman's function	6.2
$\Phi(\alpha, \gamma; z)$	confluent hypergeometric function	6.1
$\psi(x)$	Psi function	1.6
$T_n(x)$	Chebyshev's polynomials of the first kind	4.1

Notation	Function Name	Number of For- mula
$U_n(x)$	Chebyshev's polynomials of the second kind	4.2
$Z_\nu(z)$	Bessel functions	5.1

# Chapter 1

## Gamma Functions

$$\Gamma(z) = \int_0^\infty e^{-t} t^{z-1} dt \quad (1.1)$$

`\ensuremath` is only required here if using hyperlinks.

$$\Gamma(x+1) = x\Gamma(x) \quad (1.2)$$

$$\gamma(\alpha, x) = \int_0^x e^{-t} t^{\alpha-1} dt \quad (1.3)$$

$$\Gamma(\alpha, x) = \int_x^\infty e^{-t} t^{\alpha-1} dt \quad (1.4)$$

$$\Gamma(z) = \Gamma(\alpha, x) + \gamma(\alpha, x) \quad (1.5)$$

$$\psi(x) = \frac{d}{dx} \ln \Gamma(x) \quad (1.6)$$

## Chapter 2

### Error Functions

$$\text{erf}(x) = \frac{2}{\sqrt{\pi}} \int_0^x e^{-t^2} dt \quad (2.1)$$

$$\text{erfc} = 1 - \text{erf}(x) \quad (2.2)$$

## Chapter 3

### Beta Function

$$B(x, y) = 2 \int_0^1 t^{x-1} (1-t)^{y-1} dt \quad (3.1)$$

Alternatively:

$$B(x, y) = 2 \int_0^{\frac{\pi}{2}} \sin^{2x-1} \phi \cos^{2y-1} \phi d\phi \quad (3.2)$$

$$B(x, y) = \frac{\Gamma(x)\Gamma(y)}{\Gamma(x+y)} = B(y, x) \quad (3.3)$$

$$B_x(p, q) = \int_0^x t^{p-1} (1-t)^{q-1} dt \quad (3.4)$$



# Chapter 4

## Polynomials

### 4.1 Chebyshev's polynomials

$$T_n(x) = \cos(n \arccos x) \quad (4.1)$$

$$U_n(x) = \frac{\sin[(n+1) \arccos x]}{\sin[\arccos x]} \quad (4.2)$$

### 4.2 Hermite polynomials

$$H_n(x) = (-1)^n e^{x^2} \frac{d^n}{dx^n} (e^{-x^2}) \quad (4.3)$$

### 4.3 Laguerre polynomials

$$L_n^\alpha(x) = \frac{1}{n!} e^x x^{-\alpha} \frac{d^n}{dx^n} (e^{-x} x^{n+\alpha}) \quad (4.4)$$

# Chapter 5

## Bessel Functions

Bessel functions  $Z_\nu$  are solutions of

$$\frac{d^2 Z_\nu}{dz^2} + \frac{1}{z} \frac{dZ_\nu}{dz} + \left(1 - \frac{\nu^2}{z^2}\right) Z_\nu = 0 \quad (5.1)$$

## Chapter 6

### Confluent hypergeometric function

$$\Phi(\alpha, \gamma; z) = 1 + \frac{\alpha}{\gamma} \frac{z}{1!} + \frac{\alpha(\alpha+1)}{\gamma(\gamma+1)} \frac{z^2}{2!} + \frac{\alpha(\alpha+1)(\alpha+2)}{\gamma(\gamma+1)(\gamma+2)} \frac{z^3}{3!} + \cdots \quad (6.1)$$

$$k_\nu(x) = \frac{2}{\pi} \int_0^{\pi/2} \cos(x \tan \theta - \nu \theta) d\theta \quad (6.2)$$

## Chapter 7

### Parabolic cylinder functions

$$D_p(z) = 2^{\frac{p}{2}} e^{-\frac{z^2}{4}} \left\{ \frac{\sqrt{\pi}}{\Gamma\left(\frac{1-p}{2}\right)} \Phi\left(-\frac{p}{2}, \frac{1}{2}; \frac{z^2}{2}\right) - \frac{\sqrt{2\pi}z}{\Gamma\left(-\frac{p}{2}\right)} \Phi\left(\frac{1-p}{2}, \frac{3}{2}; \frac{z^2}{2}\right) \right\} \quad (7.1)$$

## Chapter 8

### Elliptical Integral of the First Kind

$$F(\phi, k) = \int_0^\phi \frac{d\alpha}{\sqrt{1 - k^2 \sin^2 \alpha}} \quad (8.1)$$

# Chapter 9

## Constants

$$\textcolor{red}{C} = 0.577\,215\,664\,901\dots \tag{9.1}$$

$$\textcolor{red}{G} = 0.915\,965\,594\dots \tag{9.2}$$