

## The error and complementary error function

The error function:

$$\text{erf}(x) = \frac{2}{\sqrt{\pi}} \int_0^x e^{-\xi^2} d\xi$$

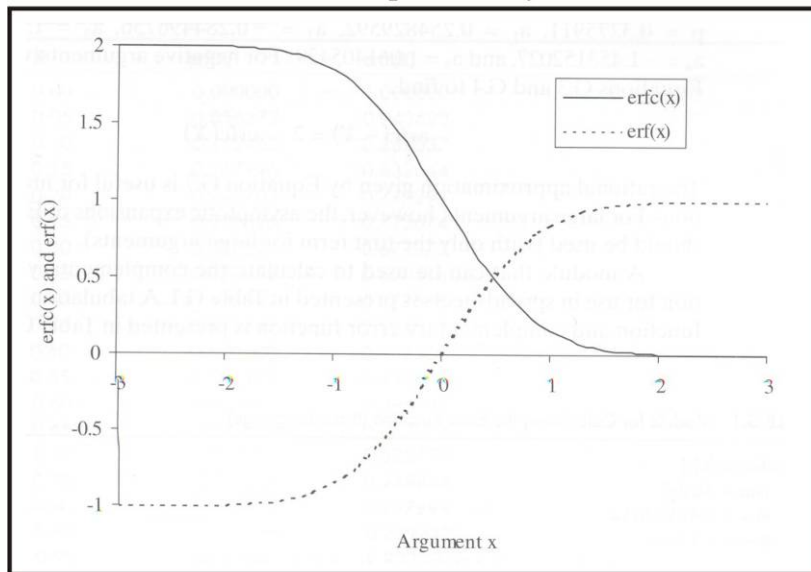
The complementary error function:

$$\text{erfc}(x) = 1 - \text{erf}(x) = \frac{2}{\sqrt{\pi}} \int_x^{\infty} e^{-\xi^2} d\xi$$

Some identities:

$$\begin{aligned} \text{erf}(-x) &= -\text{erf}(x) \\ \text{erfc}(-x) &= 1 + \text{erf}(x) = 2 - \text{erfc}(x) \end{aligned}$$

The error function and complementary error function



Module for calculating the Complementary Error Function

```

Function erfc(x)
  tmp = Abs(x)
  Pi = 3.141592654
  If tmp > 3 Then
    f1 = (1 - 1 / (2 * tmp ^ 2) + 3 / (4 * tmp ^ 4) - 5 / (6 * tmp ^ 6))
    fun = f1 * Exp(-tmp * tmp) / (tmp * Sqr(Pi))
    If tmp = x Then
      erfc = fun
    Else
      erfc = 2 - fun
    End If
  Else
    tmp2 = 1 / (1 + 0.3275911 * tmp)
    tmp3 = 0.254829592 * tmp2 - 0.284496736 * tmp2 ^ 2 + 1.421413741 * tmp2 ^ 3
    tmp4 = -1.453152027 * tmp2 ^ 4 + 1.061405429 * tmp2 ^ 5
    fun = (tmp3 + tmp4) * Exp(-tmp * tmp)
    If tmp = x Then
      erfc = fun
    Else
      erfc = 2 - fun
    End If
  End If
End Function
    
```

The Error Functions

X	erf(X)	erfc(X)
0.00	0.000000	1.000000
0.05	0.056372	0.943628
0.10	0.112463	0.887537
0.15	0.167996	0.832044
0.20	0.222703	0.777297
0.25	0.276326	0.723674
0.30	0.328627	0.671373
0.35	0.379382	0.620618
0.40	0.428392	0.571608
0.45	0.475482	0.524518
0.50	0.520500	0.479500
0.55	0.563323	0.436677
0.60	0.603856	0.396144
0.65	0.642029	0.357971
0.70	0.677801	0.322199
0.75	0.711156	0.288844
0.80	0.742101	0.257899
0.85	0.770668	0.229332
0.90	0.796908	0.203092
0.95	0.820891	0.179109
1.00	0.842701	0.157299
1.10	0.880205	0.119795
1.20	0.910314	0.089686
1.30	0.934008	0.065992
1.40	0.952285	0.047715
1.50	0.966105	0.033895
1.60	0.976348	0.023652
1.70	0.983790	0.016210
1.80	0.989091	0.010909
1.90	0.992790	0.007210
2.00	0.995322	0.004678
2.10	0.997021	0.002979
2.20	0.998137	0.001863
2.30	0.998857	0.001143
2.40	0.999311	0.000689
2.50	0.999593	0.000407
2.60	0.999764	0.000236
2.70	0.999866	0.000134
2.80	0.999925	0.000075
2.90	0.999959	0.000041
3.00	0.999978	0.000022