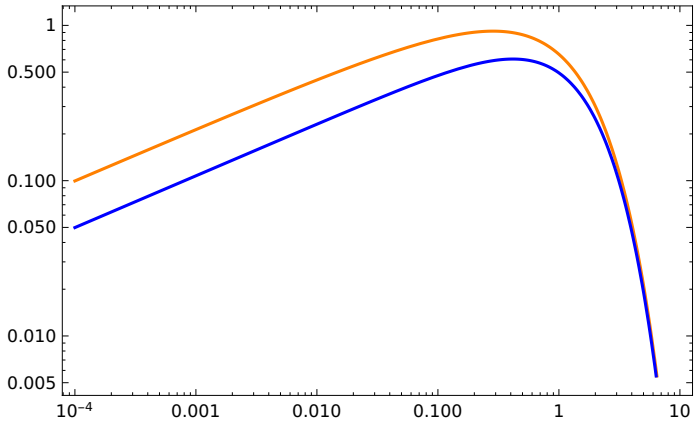
```
2 + 2
```

4

```
f[x_] = x ∫_x^∞ BesselK[5/3, x] dx;
g[x_] = x BesselK[2/3, x];
LogLogPlot[{f[x], g[x]}, {x, 10^-4, 10}, Frame → True, PlotStyle → {Orange, Blue}]
```



Assymptotic expansion of modified Bessel functions for small/large z

$$KS[\nu\_, z\_] = \frac{\text{Gamma}[\nu]}{2}\left(\frac{2}{z}\right)^{\nu};$$

$$KL[\nu\_, z\_] = \sqrt{\frac{\pi}{2\,z}}\; e^{-z}\left(1 + \frac{4\,\nu^2 - 1}{8\,z} + \frac{(4\,\nu^2 - 1)\,(4\,\nu^2 - 9)}{2!\times 8\,z^2}\right);$$

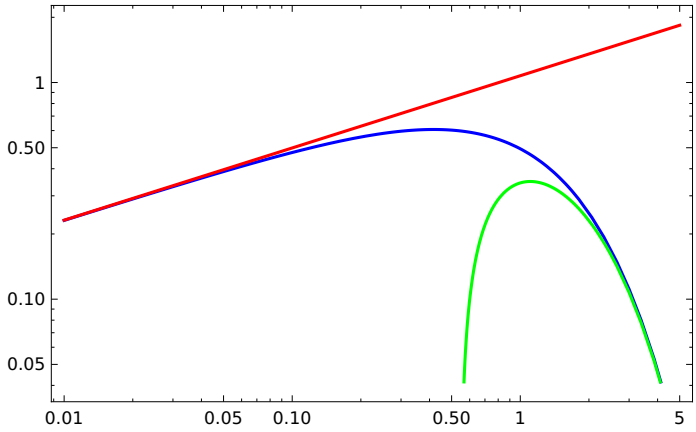
First the G (x) functions

```
gS[z_] = FullSimplify[z KS[2/3, z]]
gL[z_] = FullSimplify[z KL[2/3, z]]
```

$$\frac{\text{Gamma}\left[\frac{2}{3}\right]}{2^{1/3}\left(\frac{1}{z}\right)^{1/3}}$$

$$\frac{e^{-z}\sqrt{\frac{\pi}{2}}\left(\frac{1}{z}\right)^{3/2}\left(-455 + 18\,z\,(7 + 72\,z)\right)}{1296}$$

```
LogLogPlot[{g[x], gS[x], gL[x]}, {x, 10^-2, 5},
 Frame → True, PlotStyle → {Blue, Red, Green}]
```



Now the F(x) functions

```
fS[z_] = FullSimplify[z ∫_z^∞ KS[5/3, x] dx, Assumptions → {z ∈ Reals, z > 0}]
fL[z_] = FullSimplify[z ∫_z^∞ KL[5/3, x] dx, Assumptions → {z ∈ Reals, z > 0}]
```

$$2^{2/3}\, z^{1/3}\, \text{Gamma}\left[\frac{2}{3}\right]$$

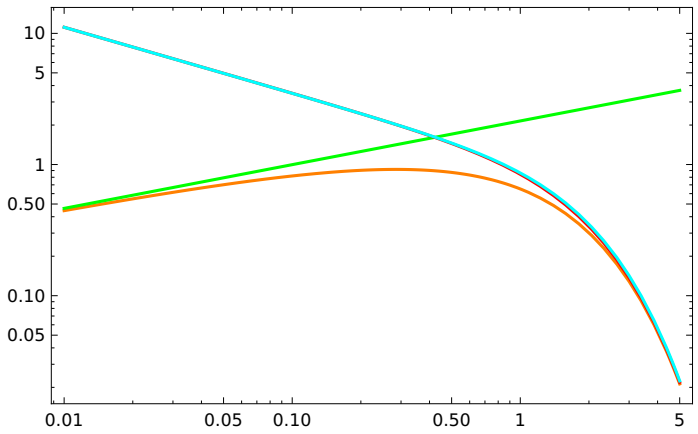
$$\frac{\sqrt{\frac{\pi}{2}}\, z \left(\frac{91\, e^{-z}\, (19+16\, z)}{z^{3/2}} + 488\, \sqrt{\pi}\, \text{Erfc}\left[\sqrt{z}\right]\right)}{1944}$$

Now introduce an expansion of the Erfc function

$$\text{fL2}[z\_] = \frac{\sqrt{\frac{\pi}{2}}\, z \left(\frac{91\, e^{-z}\, (19+16\, z)}{z^{3/2}} + 488\, \sqrt{\pi}\, \left(\frac{1}{6}\, e^{-z} + \frac{1}{2}\, e^{-(4/3)\, z}\right)\right)}{1944}$$

$$\frac{\sqrt{\frac{\pi}{2}}\, z \left(488 \left(\frac{1}{2}\, e^{-4\, z/3} + \frac{e^{-z}}{6}\right) \sqrt{\pi} + \frac{91\, e^{-z}\, (19+16\, z)}{z^{3/2}}\right)}{1944}$$

```
LogLogPlot[{f[x], fS[x], fL[x], fL2[x]}, {x, 10^-2, 5},
 Frame → True, PlotStyle → {Orange, Green, Red, Cyan}]
```



This are the small/large x expressions that are going to be used in the code

For F (x)

```
ExpandAll[fS[x]] // N
FullSimplify[ExpandAll[fL2[x]] // N]
```

$$2.14953\, x^{1/3}$$

$$0.278823\, e^{-1.33333\, x}\, x + \frac{e^{-1.\, x}\left(1.1147 + 0.938696\, x + 0.092941\, x^{3/2}\right)}{\sqrt{x}}$$

For G (x)

```
ExpandAll[gS[x]] // N
FullSimplify[ExpandAll[gL[x]] // N]
```

$$\frac{1.07476}{\left(\frac{1}{x}\right)^{1/3}}$$

$$1.25331\, e^{-1.\, x}\left(\frac{1}{x}\right)^{3/2}\left(-0.35108 + x\left(0.0972222 + 1.\, x\right)\right)$$

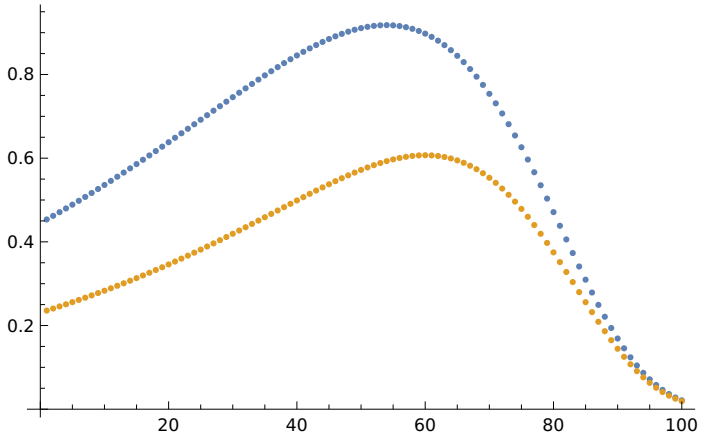
Now Lets do tables for a range in x between 0.01 and 5

Log spaced numbers

```
{a, b, c} = {0.01, 100, 5};
t = (c / a) ^ (1 / b) // N ;
Xlist = a * t^Range[b];
Flist := {}
Glist := {}

For[i = 1, i < 101, i++,
 {AppendTo[Flist, f[ Xlist[[i]]]], AppendTo[Glist, g[ Xlist[[i]]]]}]

ListPlot[{Flist, Glist}]
```



Write to textfiles

```
Export["Xlist.txt", Xlist]
Export["Flist.txt", Flist]
Export["Glist.txt", Glist]
```

Xlist.txt

Flist.txt

Glist.txt