```
Minimize[{x, x^2 + y^2 - 1 == 0}, {x, y}]
```

{-1, {x → -1, y → 0}}

```
Minimize[{Integrate[x^2, x], x^2 + y^2 - 1 == 0}, {x, y}]
```

$$\left\{-\frac{1}{3}, \{x \to -1, y \to 0\}\right\}$$

```
Minimize[{MarcumQ[1, x, x], x^2 + y^2 - 1 == 0}, {x, y}]
```

Minimize::nint : Warning: Minimize used numeric integration to show that the result is a global minimum. ≫

$$\left\{\frac{1}{2}\left(1+\frac{\text{BesselI}[0,1]}{e}\right), \{x \to -1, y \to 0\}\right\}$$

```
"Expected Rs"
```

Out[3]= Expected Rs

```
In[5]:= Simplify[Integrate[Log2[1 + x / nps] * 1 / Gamma[a] ×
           1 / b^a x^(-a - 1) Exp[-1 / (b x)], {x, 0, Infinity} ]]
```

Out[5]= ConditionalExpression[

$$\left(b^{-a}\left(\frac{1}{nps}\right)^{a}\left(\left(-\frac{1}{b\,nps}\right)^{-a}\pi\,\text{Csc}[a\,\pi]\left(\text{Gamma}[a]-\text{Gamma}\left[a,-\frac{1}{b\,nps}\right]\right)+\left(\frac{1}{b}\right)^{1-a} nps^{-1+a}\,\text{Gamma}[-1+a]\,\text{HypergeometricPFQ}\left[\{1,1\},\{2,2-a\},\frac{1}{b\,nps}\right]\right)\right)\Big/$$

$$(\text{Gamma}[a]\,\text{Log}[2]),\ \text{Re}[a]>0\ \&\&\ (\text{Arg}[nps]<\pi\ ||\ (\text{Re}[nps]>0\ \&\&\ nps\in\text{Reals}))\ \&\&$$

$$\left(\left(\frac{1}{nps}\in\text{Reals}\ \&\&\ \text{Re}\left[\frac{1}{nps}\right]>0\right)\ ||\ \text{Abs}[\text{Arg}[nps]]<\pi\right)\Big]$$

```
"Density of a Inverse non central chi-squared distribution,
  where lambda is gamma distributed: Bessel function: Density
  of the regulated power at ST:Here the energy (that includes
  path loss, noise power, interference temp, normalization
  constant) is exponetially distributed: Working: Final version"
```

```
In[7]:= Simplify[Integrate[K * it * nc / (2 np x^2)
           Exp[- K / (2 np) (nc it / x  + pl g tp) ] (nc it / (x pl tp g)) ^ (K / 4 - 1 / 2)
           BesselI[K / 2 - 1, √(K^2 pl nc it tp g / (x np^2))] Exp[-g], {g, 0, Infinity}]]
```

Out[7]= ConditionalExpression[

$$\left(e^{-\frac{it\,K\,nc}{2\,np\,x+K\,pl\,tp\,x}}(-2+K)\,K\,np\,pl\,tp\left(2+\frac{K\,pl\,tp}{np}\right)^{K/2}\left(\frac{it\,nc}{pl\,tp\,x}\right)^{\frac{2+K}{4}}\left(\frac{it\,K^{2}\,nc\,pl\,tp}{np^{2}\,x}\right)^{\frac{1}{2}-\frac{K}{4}}\left(\text{Gamma}\left[-1+\frac{K}{2}\right]-\text{Gamma}\left[-1+\frac{K}{2},\left(it\,K^{2}\,nc\,pl\,tp\right)\Big/\left(4\,np^{2}\,x+2\,K\,np\,pl\,tp\,x\right)\right]\right)\right)\Big/$$

$$\left(2\,(2\,np+K\,pl\,tp)^{2}\,x\,\text{Gamma}\left[\frac{K}{2}\right]\right),\ \text{Re}[K]<6\ \&\&$$

$$\left(\text{Im}\left[\sqrt{\left(\left(it\,K^{2}\,nc\,pl\,tp\right)\Big/\left(np^{2}\,x\right)\right)}\right]>0\ ||\ \text{Re}\left[\sqrt{\left(\left(it\,K^{2}\,nc\,pl\,tp\right)\Big/\left(np^{2}\,x\right)\right)}\right]>0\right)\ \&\&$$

$$\text{Re}\left[\frac{K\,pl\,tp}{np}\right]>-2\Big]$$

"Determine the Density for power received at PR"

In[13]:=

```
Simplify[Integrate[N / (2 np) K it g pl / x^2 Exp[-N pl g / (2 np) (1 / x + tp)]
   (K it / x) ^ (N / 4 - 1 / 2) BesselI[N / 2  - 1, N pl g / np √( K it tp / x ) ]
   g^ (a - 1) Exp[-g / b], {g, 0, Infinity}]]
```

Out[13]= ConditionalExpression[

$$\left(2^{-1+a}\, b\, N^2\, pl\, \left(\frac{it\, K}{x}\right)^{\frac{2+N}{4}} \left(\left(b^2\, it\, K\, N^2\, pl^2\, tp\, x\right) \big/ (2\, np\, x + b\, N\, pl\, (1 + tp\, x))^2\right)^{\frac{1}{4}(-2+N)} \left(\frac{2}{b} + (N\, pl\, (1 + tp\, x)) \,/\, (np\, x)\right)^{-a} \text{Gamma}\left[a + \frac{N}{2}\right] \text{Hypergeometric2F1}\left[\frac{1}{4}(2\,a + N),\ \frac{1}{4}(2 + 2\,a + N),\ \frac{N}{2},\ \left(4\, b^2\, it\, K\, N^2\, pl^2\, tp\, x\right) \big/ (2\, np\, x + b\, N\, pl\, (1 + tp\, x))^2\right]\right) \Big/$$

$$\left((2\, np\, x + b\, N\, pl\, (1 + tp\, x))\, \text{Gamma}\left[1 + \frac{N}{2}\right]\right),\ \text{Re}\left[\frac{N\, pl\, \sqrt{\frac{it\, K\, tp}{x}}}{np}\right] \geq 0\ \&\&$$

$$\left(\text{Im}\left[\frac{N\, pl\, \sqrt{\frac{it\, K\, tp}{x}}}{np}\right] > 0\ ||\ \text{Re}\left[\frac{N\, pl\, \sqrt{\frac{it\, K\, tp}{x}}}{np}\right] > 0\right)\ \&\&\ \text{Re}[a] > -1\ \&\&\ \text{Re}\left[a + \frac{N}{2}\right] > 0\Big]$$