In[1]:=
```
(* plna *)
```

In[2]:=
```
f1 = Integrate[x BesselJ[0, β x], {x, 0, 1}]
```

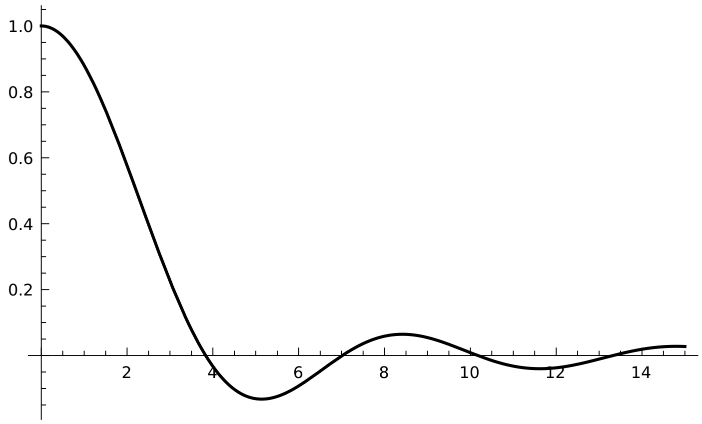
Out[2]= $\frac{\text{BesselJ}[1, \beta]}{\beta}$

In[3]:=
```
f1 = f1 / Limit[f1, β → 0]
```

Out[3]= $\frac{2\,\text{BesselJ}[1, \beta]}{\beta}$

In[4]:=
```
p1 = Plot[f1, {β, 0, 15}, PlotStyle → Black, PlotRange → All]
```

Out[4]=



In[5]:=
```
(* gaussovska apod - soucet rady *)
```

In[6]:=
```
Integrate[Exp[-x^2] BesselJ[0, x] x, {x, 0, 1}]
```

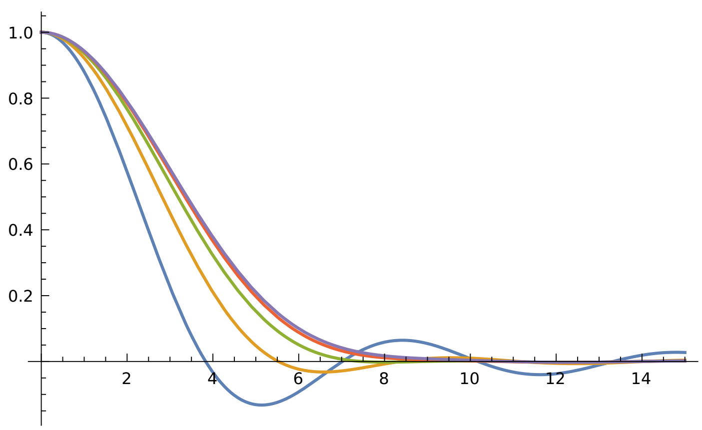
Out[6]= $\int_0^1 e^{-x^2}\, x\, \text{BesselJ}[0, x]\, dx$

In[7]:=
```
α = 2;
f2g = Table[Sum[BesselJ[m, β] 2^(m - 1) α^(2 m - 2) / β^m, {m, 1, n}], {n, 1, 10, 2}];
```

In[8]:=
```
f2gnorm = f2g / (f2g /. β → 0.001);
```

In[9]:=
```
Plot[f2gnorm, {β, 0, 15}, PlotRange → All]
```

Out[9]=



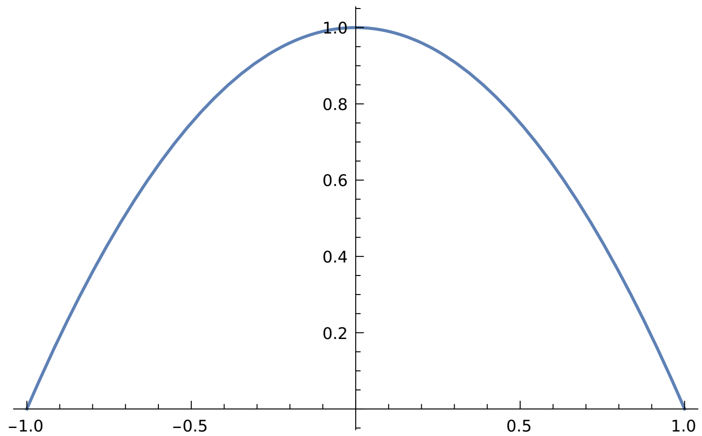
In[10]:= (* kvadraticka apod *)

In[11]:= apod = (1 - x ^ 2)

Out[11]= $1 - x^2$

In[12]:= Plot[apod, {x, -1, 1}]

Out[12]=



In[13]:= f2 = Integrate[apod x BesselJ[0, β x], {x, 0, 1}]

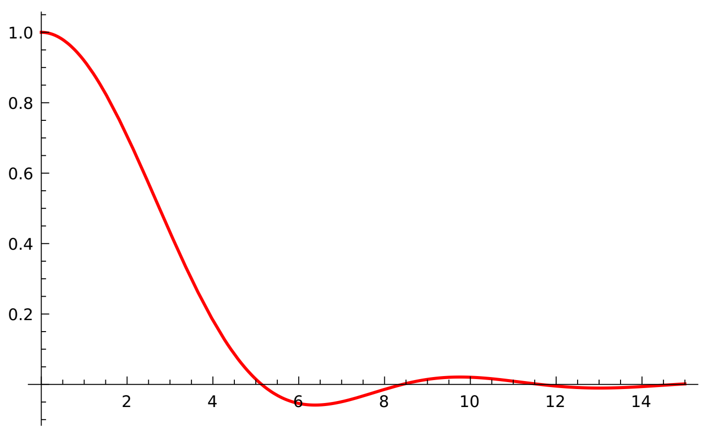
Out[13]= $\frac{2\,\text{BesselJ}[2, \beta]}{\beta^2}$

In[14]:= f2 = f2 / Limit[f2, β → 0]

Out[14]= $\frac{8\,\text{BesselJ}[2, \beta]}{\beta^2}$

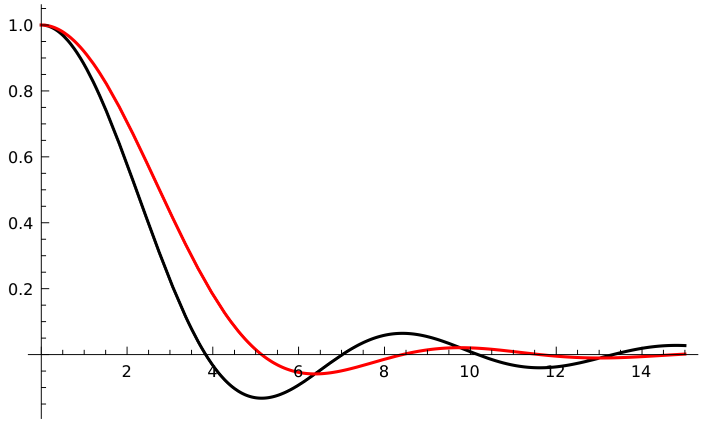
In[15]:= p2 = Plot[f2, {β, 0, 15}, PlotStyle → Red, PlotRange → All]

Out[15]=



In[16]:= `Show[{p1, p2}]`

Out[16]=



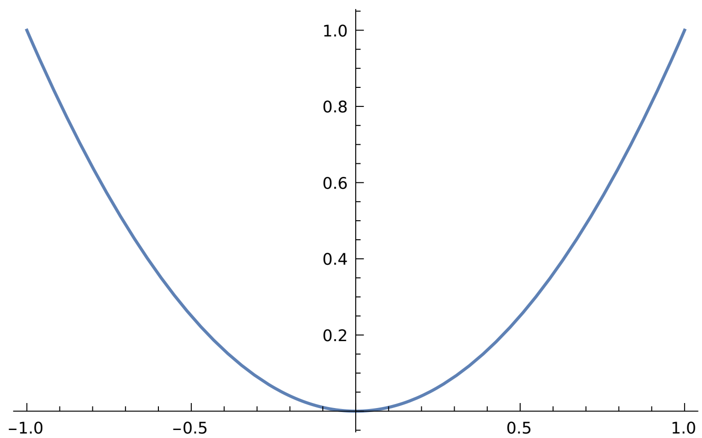
In[17]:= `(* kvadraticka inverzni apod *)`

In[18]:= `invapod = x^2`

Out[18]= x^2

In[19]:= `Plot[invapod, {x, -1, 1}]`

Out[19]=



In[20]:= `f3 = Integrate[invapod x BesselJ[0, β x], {x, 0, 1}]`

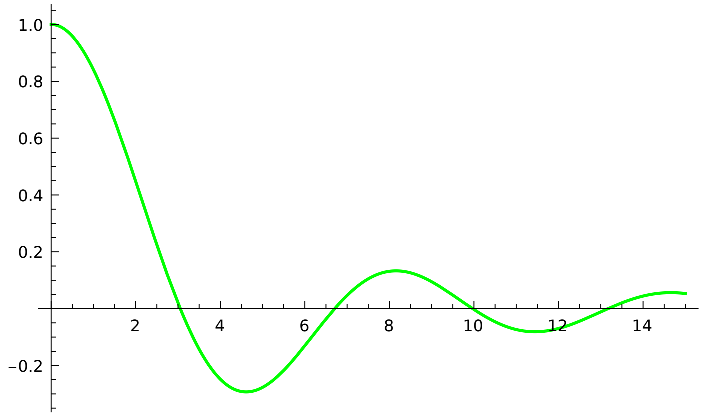
Out[20]= $$\frac{2\,\text{BesselJ}[2, \beta] - \beta\,\text{BesselJ}[3, \beta]}{\beta^2}$$

In[21]:= `f3 = f3 / Limit[f3, β → 0]`

Out[21]= $$\frac{4\,(2\,\text{BesselJ}[2, \beta] - \beta\,\text{BesselJ}[3, \beta])}{\beta^2}$$

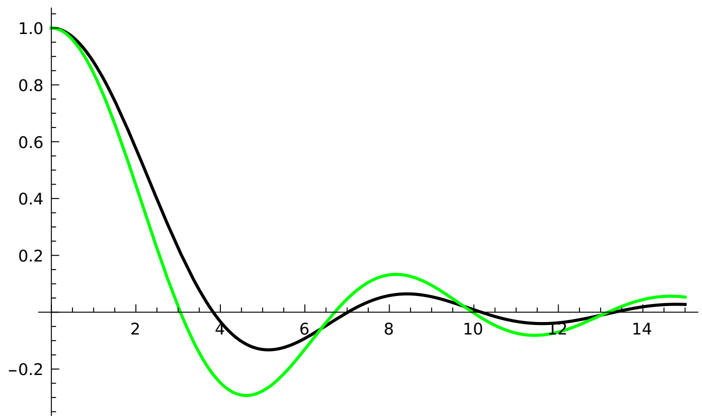
In[22]:=
```
p3 = Plot[f3, {β, 0, 15}, PlotStyle → Green, PlotRange → All]
```

Out[22]=



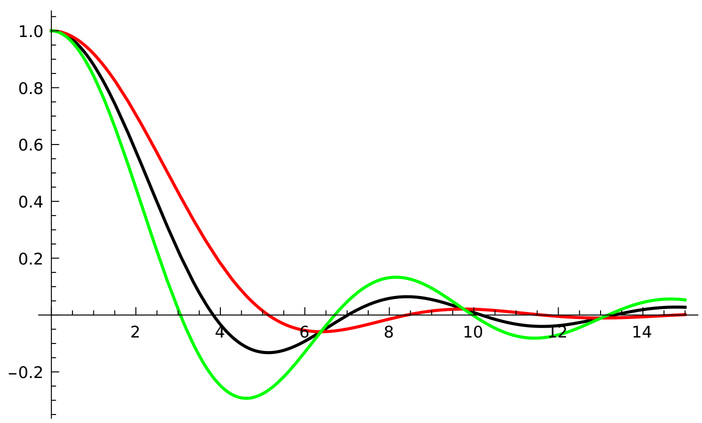
In[23]:=
```
Show[{p1, p3}]
```

Out[23]=



In[24]:=
```
Show[{p1, p2, p3}]
```

Out[24]=



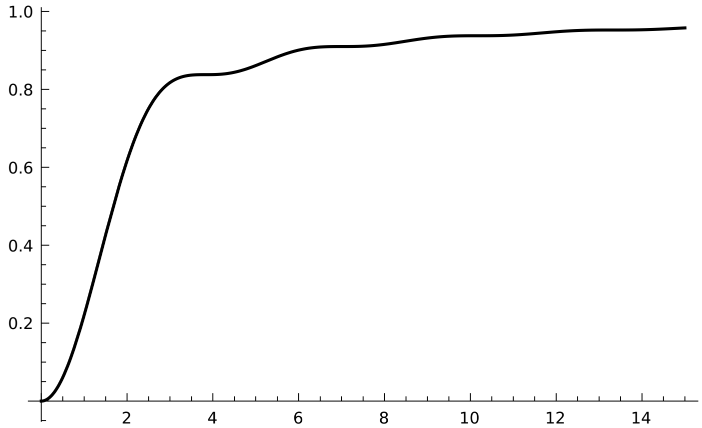
In[25]:=
```
(* uzavrena energie *)
```

In[26]:=
```
tot1 = Integrate[β f1^2, {β, 0, r}, Assumptions → r > 0]
```

Out[26]= $-2\left(-1+\text{BesselJ}[0, r]^2+\text{BesselJ}[1, r]^2\right)$

In[27]:=
```
tot1 = tot1 / Integrate[β f1^2, {β, 0, Infinity}]
```
Out[27]=
$$1 - \text{BesselJ}[0, r]^2 - \text{BesselJ}[1, r]^2$$

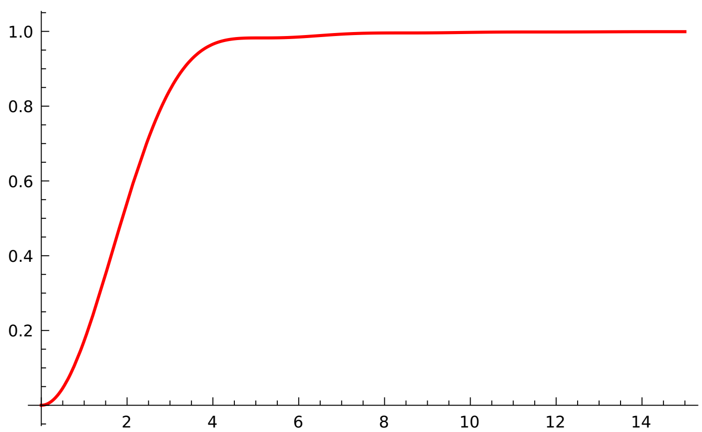
In[28]:=
```
p1b = Plot[tot1, {r, 0, 15}, PlotStyle → Black, PlotRange → All]
```
Out[28]=



In[29]:=
```
tot2 = Integrate[β f2^2, {β, 0, r}, Assumptions → r > 0]
```
Out[29]=
$$\frac{1}{3 r^4} 8 \left(r^4 - 4 r^2 \text{BesselJ}[0, r]^2 + 16 r \text{BesselJ}[0, r] \text{BesselJ}[1, r] - 4 \left(4 + r^2\right) \text{BesselJ}[1, r]^2\right)$$

In[30]:=
```
tot2 = tot2 / Integrate[β f2^2, {β, 0, Infinity}]
```
Out[30]=
$$\frac{1}{r^4} \left(r^4 - 4 r^2 \text{BesselJ}[0, r]^2 + 16 r \text{BesselJ}[0, r] \text{BesselJ}[1, r] - 4 \left(4 + r^2\right) \text{BesselJ}[1, r]^2\right)$$

In[31]:=
```
p2b = Plot[tot2, {r, 0, 15}, PlotStyle → Red, PlotRange → All]
```
Out[31]=

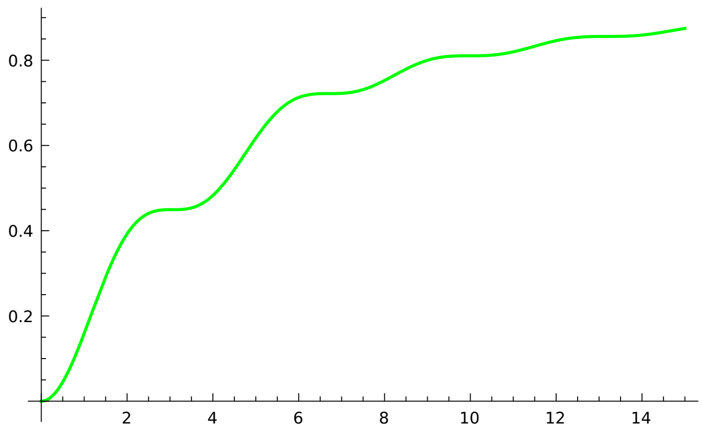


In[32]:=
```
tot3 = Integrate[β f3^2, {β, 0, r}, Assumptions → r > 0]
```
Out[32]=
$$-\frac{1}{3 r^4} 8 \left(-r^4 + r^2 \left(4 + 3 r^2\right) \text{BesselJ}[0, r]^2 - 16 r \text{BesselJ}[0, r] \text{BesselJ}[1, r] + \left(16 - 8 r^2 + 3 r^4\right) \text{BesselJ}[1, r]^2\right)$$

In[33]:=
```
tot3 = tot3 / Integrate[β f3^2, {β, 0, Infinity}]
```

Out[33]=
$$-\frac{1}{r^4}\left(-r^4 + r^2 \left(4 + 3 r^2\right) \text{BesselJ}[0, r]^2 - 16 r\, \text{BesselJ}[0, r]\, \text{BesselJ}[1, r] + \left(16 - 8 r^2 + 3 r^4\right) \text{BesselJ}[1, r]^2\right)$$

In[34]:=
```
p3b = Plot[tot3, {r, 0, 15}, PlotStyle → Green, PlotRange → All]
```

Out[34]=


In[35]:=
```
Show[{p1b, p2b, p3b}]
```

Out[35]=