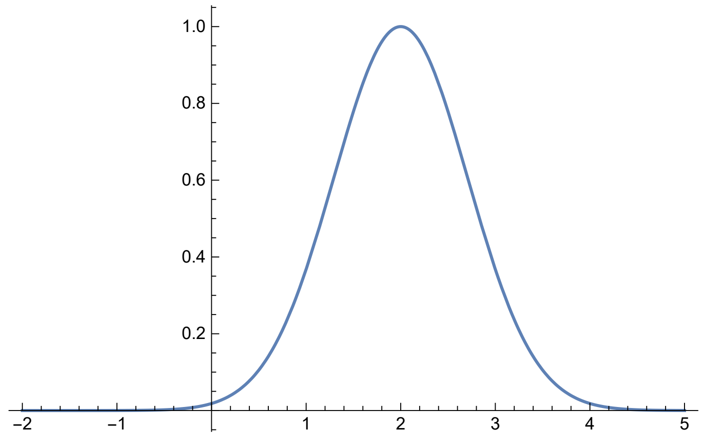
In[1]:=
```
f[x_] := Exp[-(x - a)^2];
a = 2;
Plot[f[x], {x, -2, 5}, PlotRange → Full, PlotLegends → "Expressions"]
NIntegrate[f[x], {x, -∞, ∞}]
```

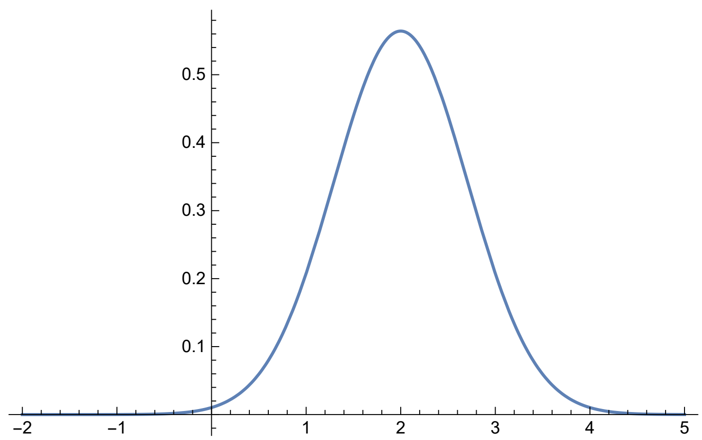
Out[3]=



Out[4]= 1.77245

In[5]:=
```
f[x_] := (1 / Sqrt[π]) * Exp[-(x - a)^2];
a = 2;
Plot[f[x], {x, -2, 5}, PlotRange → Full, PlotLegends → "Expressions"]
NIntegrate[f[x], {x, -∞, ∞}]
```

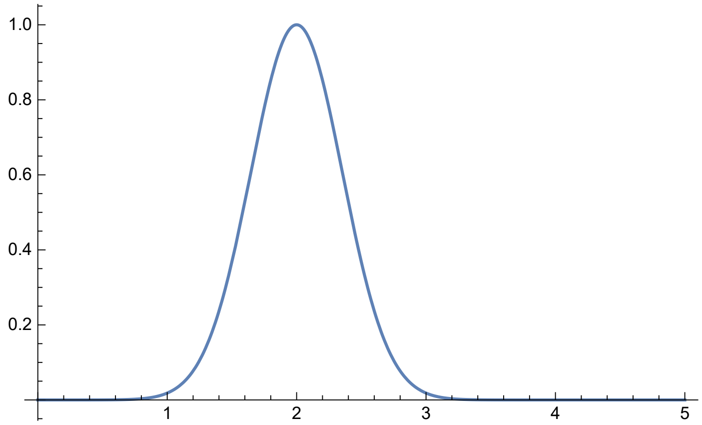
Out[7]=



Out[8]= 1.

In[9]:=
```
f[x_, k_] := Exp[-((x - a)^2) / k^2];
a = 2;
Plot[f[x, k = 0.5], {x, 0, 5}, PlotRange → Full, PlotLegends → "Expressions"]
NIntegrate[f[x, k = 0.5], {x, -∞, ∞}]
2 * NIntegrate[f[x, k = 0.5], {x, -∞, ∞}]
```

Out[11]=

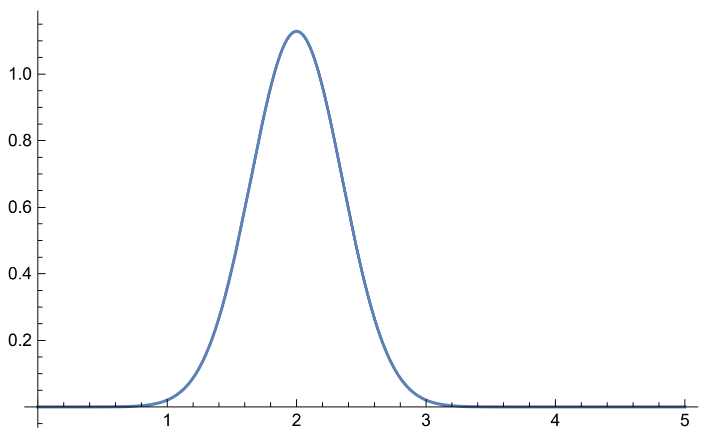


Out[12]= 0.886227

Out[13]= 1.77245

In[14]:=
```
f[x_, k_] := (1/(k Sqrt[π])) Exp[-((x - a)^2) / k^2];
a = 2;
Plot[f[x, k = 0.5], {x, 0, 5}, PlotRange → Full, PlotLegends → "Expressions"]
NIntegrate[f[x, k = 0.5], {x, -∞, ∞}]
NIntegrate[f[x, k = 0.05], {x, -∞, ∞}]
```

Out[16]=

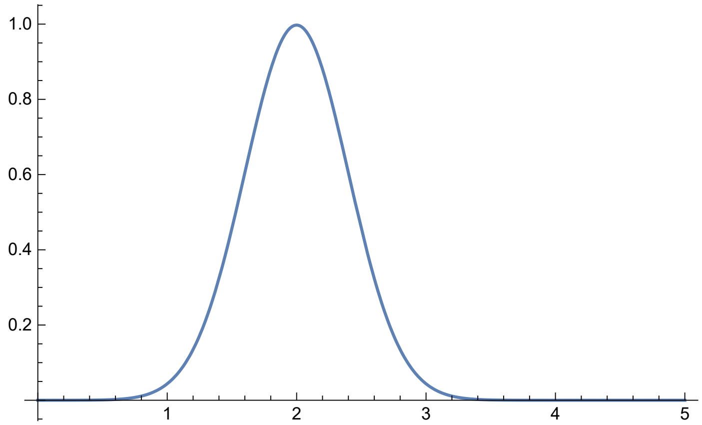


Out[17]= 1.

Out[18]= 1.

In[19]:=
```
G[x_] := (1/(σ * Sqrt[2 Pi])) Exp[-((x - a)^2) / (2 σ^2)];
a = 2; σ = 0.4;
Plot[G[x], {x, 0, 5}]
```

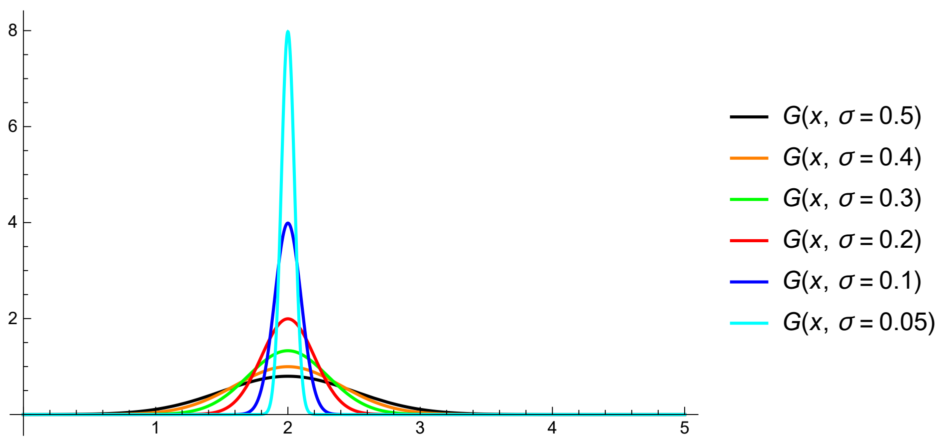
Out[21]=



In[22]:=
```
G[x_, σ_] := (1/(σ * Sqrt[2 Pi])) Exp[-((x - a)^2) / (2 σ^2)];
a = 2;
Plot[{G[x, σ = 0.5], G[x, σ = 0.4], G[x, σ = 0.3],
  G[x, σ = 0.2], G[x, σ = 0.1], G[x, σ = 0.05]}, {x, 0, 5}, PlotRange → Full,
 PlotStyle → {Black, Orange, Green, Red, Blue, Cyan}, PlotLegends → "Expressions"]
NIntegrate[G[x, σ = 0.5], {x, -∞, ∞}]
NIntegrate[G[x, σ = 0.05], {x, -∞, ∞}]
```

General: Exp[-799.918] is too small to represent as a normalized machine number; precision may be lost.

Out[24]=

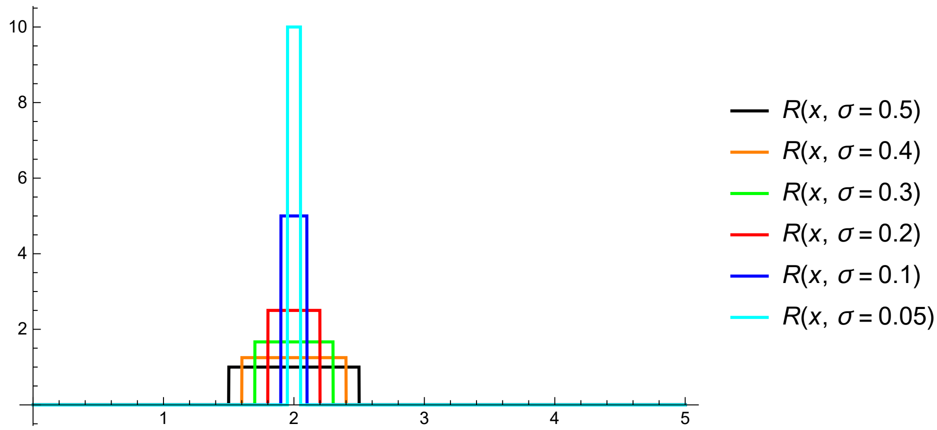


Out[25]= 1.

Out[26]= 1.

In[27]:=
```
R[x_, σ_] := Piecewise[{{1/(2 σ), -σ < x - a < σ}, {0, Modulus[x - a] > σ}}];
a = 2;
Plot[{R[x, σ = 0.5], R[x, σ = 0.4], R[x, σ = 0.3],
   R[x, σ = 0.2], R[x, σ = 0.1], R[x, σ = 0.05]}, {x, 0, 5}, PlotRange → Full,
 PlotStyle → {Black, Orange, Green, Red, Blue, Cyan}, PlotLegends → "Expressions"]
NIntegrate[R[x, σ = 0.5], {x, -∞,  ∞}]
NIntegrate[R[x, σ = 0.05], {x, -∞,  ∞}]
```

Out[29]=

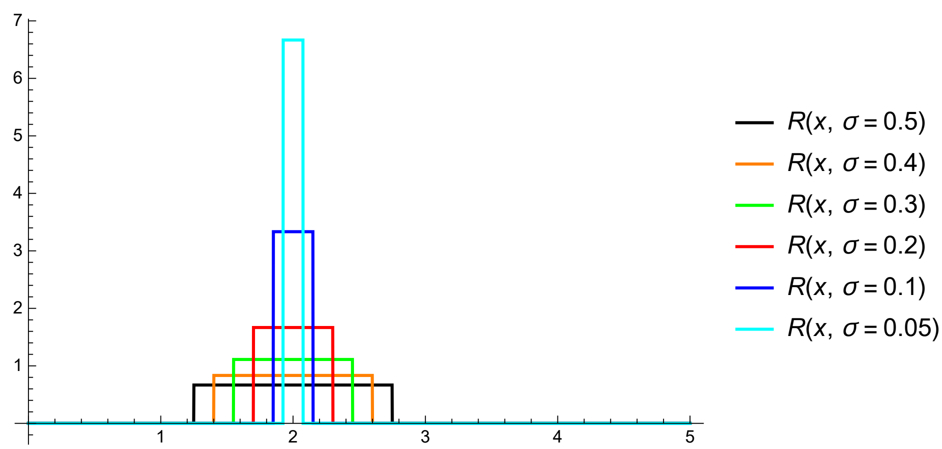


Out[30]= 1.

Out[31]= 1.

In[32]:=
```
R[x_, σ_] := Piecewise[{{1/(3 σ), -3 σ/2 < x - a < 3 σ/2}, {0, Modulus[x - a] > 3 σ/2}}];
a = 2;
Plot[{R[x, σ = 0.5], R[x, σ = 0.4], R[x, σ = 0.3],
   R[x, σ = 0.2], R[x, σ = 0.1], R[x, σ = 0.05]}, {x, 0, 5}, PlotRange → Full,
 PlotStyle → {Black, Orange, Green, Red, Blue, Cyan}, PlotLegends → "Expressions"]
NIntegrate[R[x, σ = 0.5], {x, -∞,  ∞}]
NIntegrate[R[x, σ = 0.05], {x, -∞,  ∞}]
```

Out[34]=

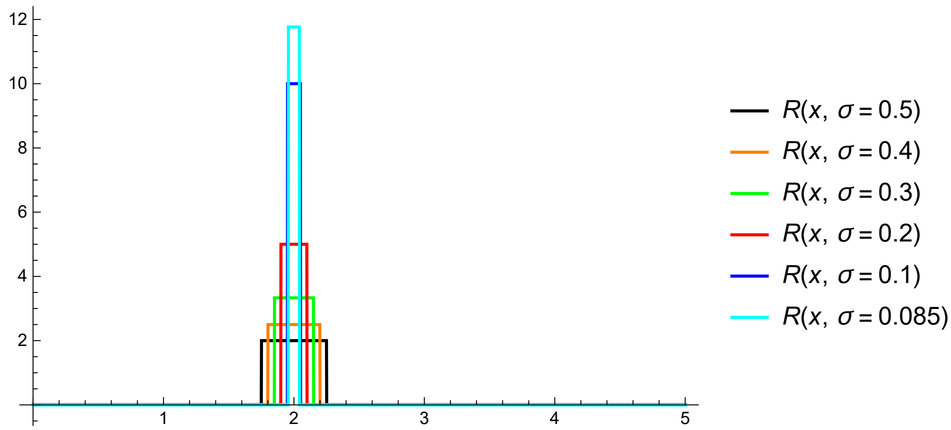


Out[35]= 1.

Out[36]= 1.

In[37]:=
```
R[x_, σ_] := Piecewise[{{1/σ, -σ/2 < x - a < σ/2}, {0, Modulus[x - a] > σ/2}}];
a = 2;
Plot[{R[x, σ = 0.5], R[x, σ = 0.4], R[x, σ = 0.3],
  R[x, σ = 0.2], R[x, σ = 0.1], R[x, σ = 0.085]}, {x, 0, 5}, PlotRange → Full,
 PlotStyle → {Black, Orange, Green, Red, Blue, Cyan}, PlotLegends → "Expressions"]
NIntegrate[R[x, σ = 0.5], {x, -∞,  ∞}]
NIntegrate[R[x, σ = 0.05], {x, -∞,  ∞}]
```

Out[39]=



Out[40]= 1.

Out[41]= 1.