In[21]:=

In[22]:=
```
M := (x ^ 2) * e ^ ((-1 / 2) * (x ^ 2))
```

In[23]:=
```
M
```

Out[23]=

$$e^{-\frac{x^2}{2}}\, x^2$$

In[24]:=
```
Integrate[M, {x, -Infinity, Infinity}]
```

Out[24]=

$$\frac{\sqrt{2\,\pi}}{\text{Log[e]}^{3/2}} \quad \text{if} \quad \text{Re[Log[e]]} > 0$$

In[25]:=
```
Integrate[M, {x, -Infinity, Infinity}] /. Log[e] → 1
```

Out[25]=

$$\sqrt{2\,\pi}$$

In[26]:=

In[27]:=
```
G := e ^ (((-1 / 2) * (x ^ 2)) + J * x)
```

In[28]:=
```
G
```

Out[28]=

$$e^{J\,x-\frac{x^2}{2}}$$

In[29]:=
```
F = Integrate[G, {x, -Infinity, Infinity}] /. Log[e] → 1
```

Out[29]=

$$e^{\frac{J^2}{2}}\, \sqrt{2\,\pi}$$

In[30]:=
```
A := Sqrt[Log[e]]
```

In[31]:=
```
A
```

Out[31]=

$$\sqrt{\text{Log[e]}}$$

In[32]:=
```
FullSimplify[A]
```

Out[32]=

$$\sqrt{\text{Log[e]}}$$

In[33]:=
```
Simplify[A] /. Log[e] → 1
```
Out[33]=
$$1$$

In[34]:=
```
D1 := D[F, J] /. Log[e] → 1
```

In[35]:=
```
D1
```
Out[35]=
$$e^{\frac{J^2}{2}}\ J\ \sqrt{2\ \pi}$$

In[36]:=
```
D[D1, J]
```
Out[36]=
$$e^{\frac{J^2}{2}}\ \sqrt{2\ \pi}\ +e^{\frac{J^2}{2}}\ J^2\ \sqrt{2\ \pi}\ \text{Log[e]}$$

In[37]:=
```
G1 := e^((x^2)/2)
```

In[38]:=
```
G1
```
Out[38]=
$$e^{\frac{x^2}{2}}$$

In[39]:=
```
D[G1, x]
```
Out[39]=
$$e^{\frac{x^2}{2}}\ x\ \text{Log[e]}$$

In[40]:=
```
D[D[G1, x], x] /. Log[e] → 1 /. x → 0
```
Out[40]=
$$1$$

In[41]:=
```
F
```
Out[41]=
$$e^{\frac{J^2}{2}}\ \sqrt{2\ \pi}$$

In[42]:=
```
D[D[F, J], J] /. Log[e] → 1 /. J → 0
```
Out[42]=
$$\sqrt{2\ \pi}$$

In[43]:=
```
(Integrate[M, {x, -Infinity, Infinity}] /. Log[e] → 1) ==
 (D[D[F, J], J] /. Log[e] → 1 /. J → 0)
```
Out[43]=
```
True
```

In[44]:=
```
M2 := (x) * e ^ ((-1 / 2) * (x ^ 2))
```

In[45]:=
```
M2
```
Out[45]=
$$e^{-\frac{x^2}{2}}\, x$$

In[46]:=
```
Integrate[M2, {x, -Infinity, Infinity}]
```
Out[46]=
```
0 if Re[Log[e]] > 0
```

In[47]:=
```
Integrate[M2, {x, -Infinity, Infinity}] == D[F, J] /. Log[e] → 1 /. J → 0
```
Out[47]=
```
True
```