Standard normal/Gaussian distribution

In[∘]:=
```
Clear[f, x, σ]
f = Exp[-0.5 x^2 / σ^2]
Refine[1/(Sqrt[2 π] σ) Integrate[f, {x, -∞, +∞}], {σ > 0}]
```

Out[∘]= $e^{-\frac{0.5 x^2}{\sigma^2}}$

Out[∘]= 1.

General FWHM as function of σ: FWHM = 2.35482 σ

```
Clear[f, x, σ, f0, sols]

(* start with standard Gaussian profile *)
f = Exp[-0.5 x^2 / σ^2]

(* get points where fwhm will be calculated *)
sols = Solve[f == 1 / 2, x];

(* poins are equidistant from origin *)
2 sols[[2, 1, 2]]
fwhm = 2 Sqrt[2 Log[2]] σ // N
```

Out[62]= $e^{-\frac{0.5 x^2}{\sigma^2}}$

Solve: Inverse functions are being used by Solve, so some solutions may not be found; use Reduce for complete solution information.

Out[64]= 2.35482 σ

Out[65]= 2.35482 σ

Spotsize FWHM as function of W0: FWHM = 2 Sqrt[Log[2]]σ

In[◦]:=
```
Clear[f, x, σ, f0, a, W0]
a = Exp[-x^2 / W0^2]
(Solve[a == 1 / 2, x] // Normal) /. {c1 → 0}
fwhm = 2 Sqrt[Log[2]] σ // N
```

Out[◦]= $e^{-\frac{x^2}{W0^2}}$

Out[◦]= $\left\{\left\{x \to -W0 \sqrt{Log[2]}\right\}, \left\{x \to W0 \sqrt{Log[2]}\right\}\right\}$

Out[◦]= 1.66511 σ

Intensity FWHM vs Field FWHM: I_FWHM/E_FWHM = 1/Sqrt[2]

In[◦]:=
```
Clear[fE, fI, f0, x, σ, fwhm]
fI = Exp[-0.5 x^2 / σ^2];
fE = Sqrt[fI];
Solve[fI == 1 / 2, x]〚2, 1, 2〛 / Solve[fE == 1 / 2, x]〚2, 1, 2〛
1 / √2 // N
```

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Out[◦]= 0.707107

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