

Experimental Physics 3 - Em-Waves, Optics, Quantum mechanics

Lecture 24

Some dates in January and February

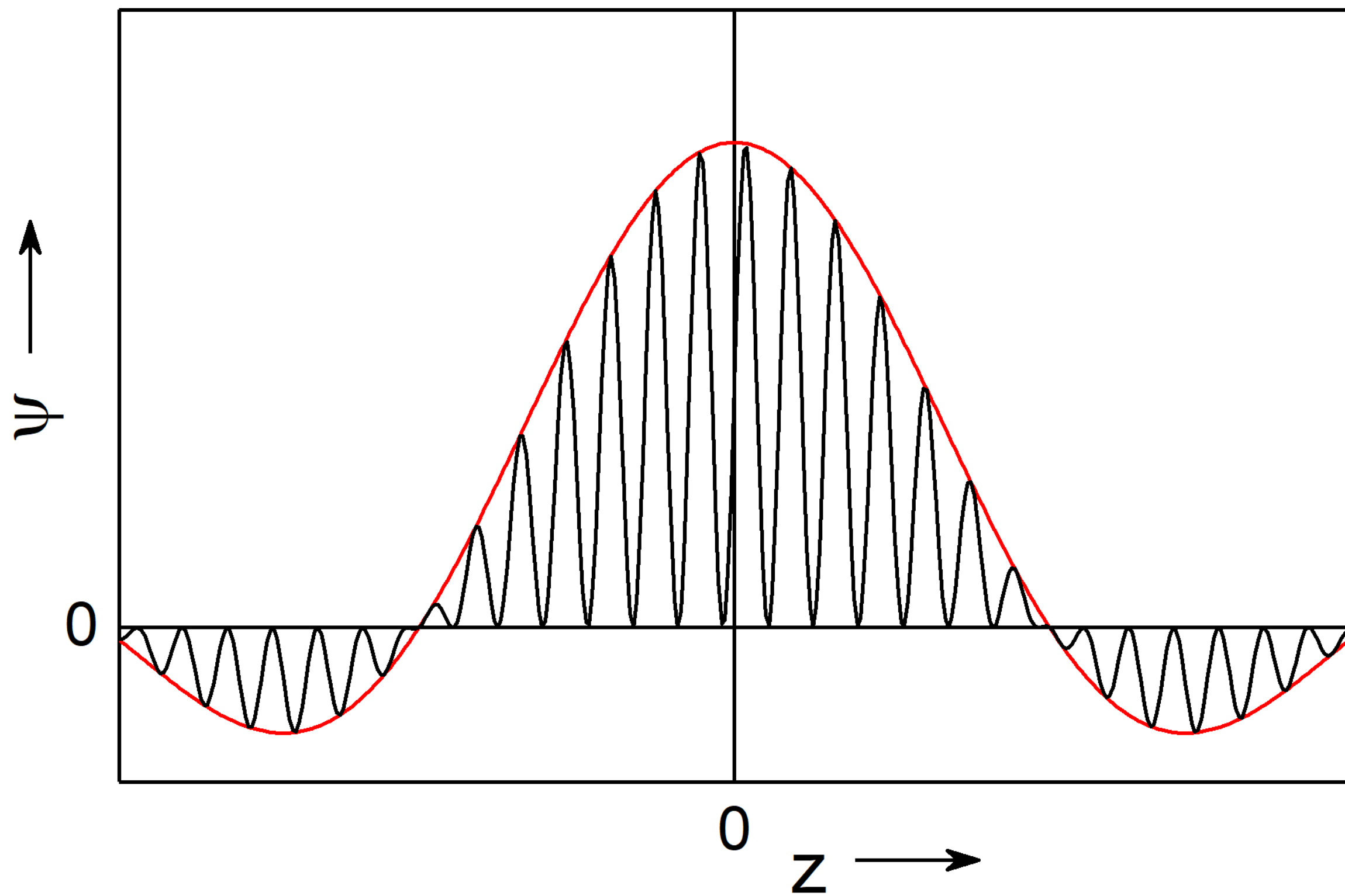
Mo	Tu	We	Th	Fr	Sa	Su
						1
2	3	4	5	6	7	8
9	10	11	12 Submission sheet 11	13	14	15
16	17	18	19 Submission mock exam	20	21	22
23	24	25	26 Submission sheet 12	27	28	29
30	31 Last Tuesday seminar	1	2 Last Thursday seminar Last lecture	3		

Exam: February 20, 2023, 9 am - 12 pm, 1 (one) DIN A4 page lettered

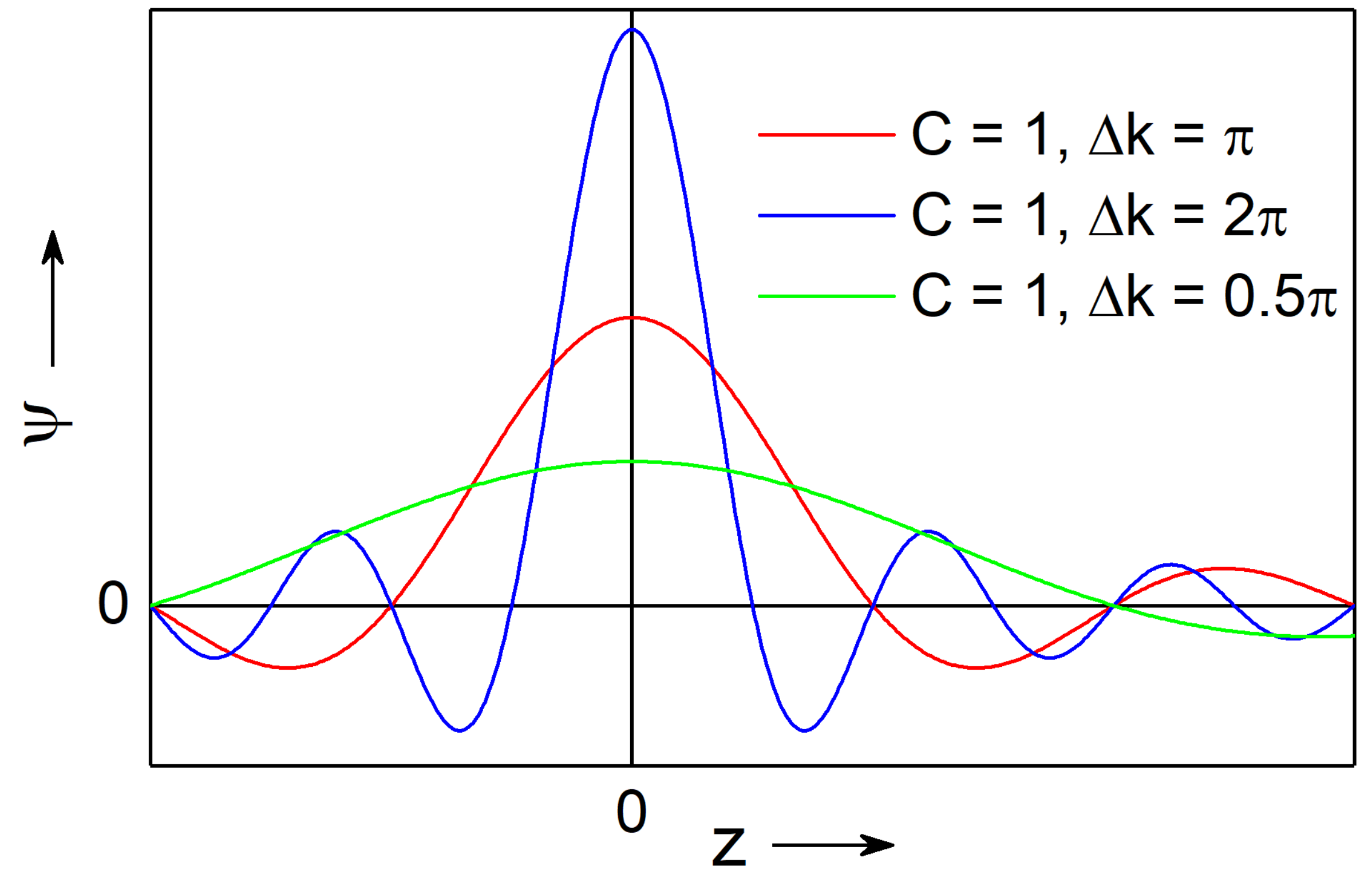
Re-exam: March 27, 2023, 9 am - 12 pm

Waves of matter

Recap - wave packet with constant amplitude

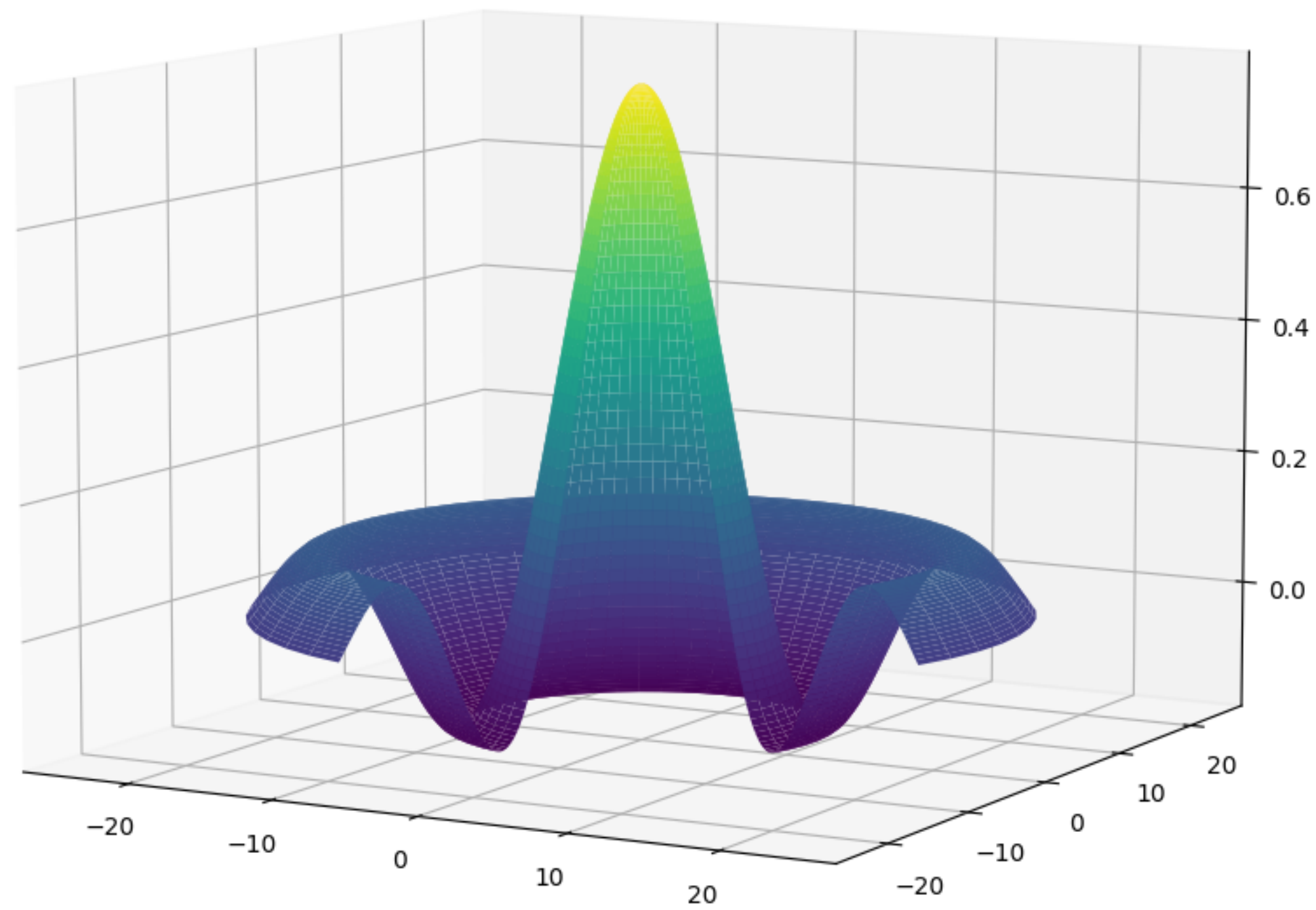


- Side lobes
- Negative values of ψ



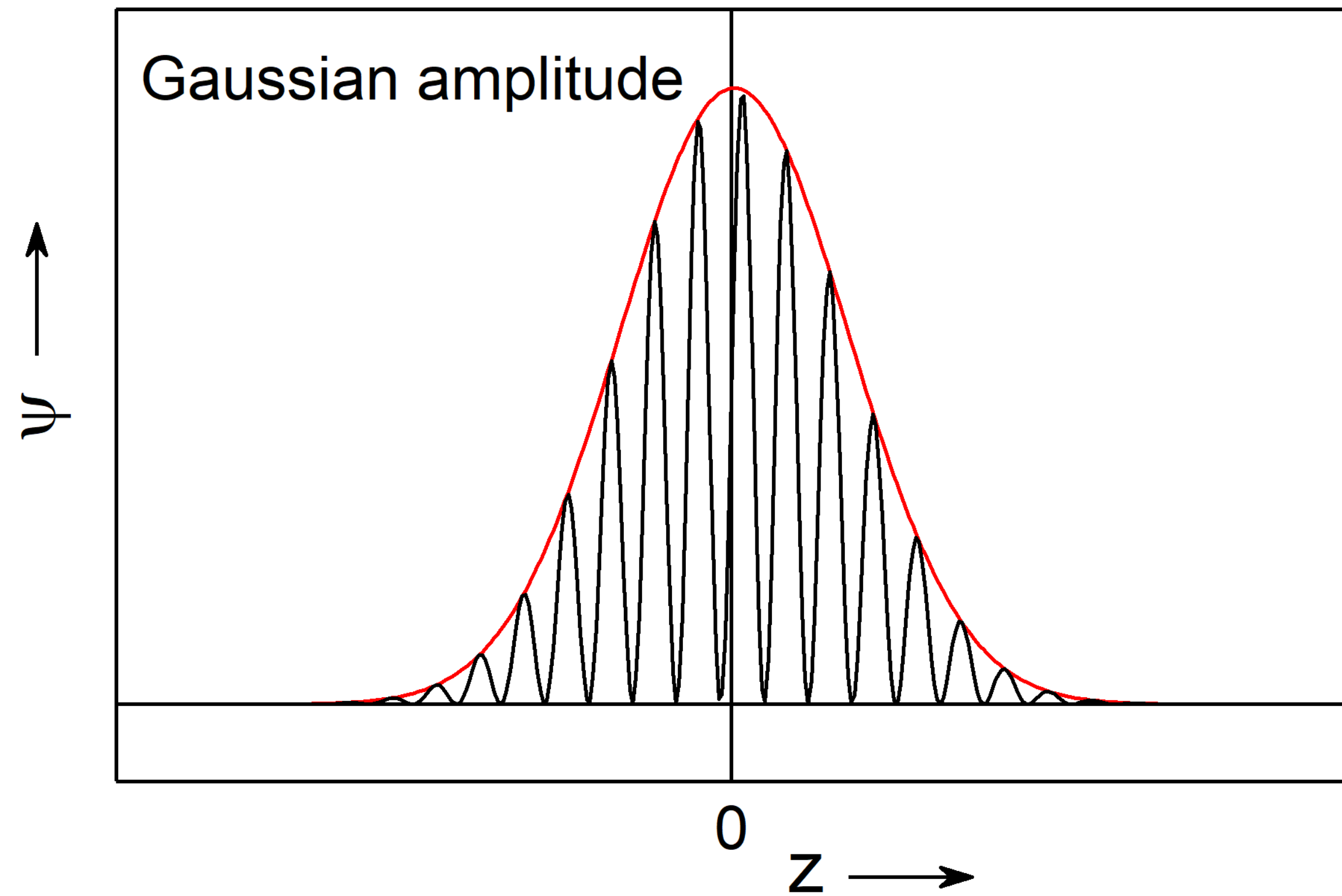
- The broader the interval Δk , the narrower the central maximum

Wave packet with constant amplitude and probability density



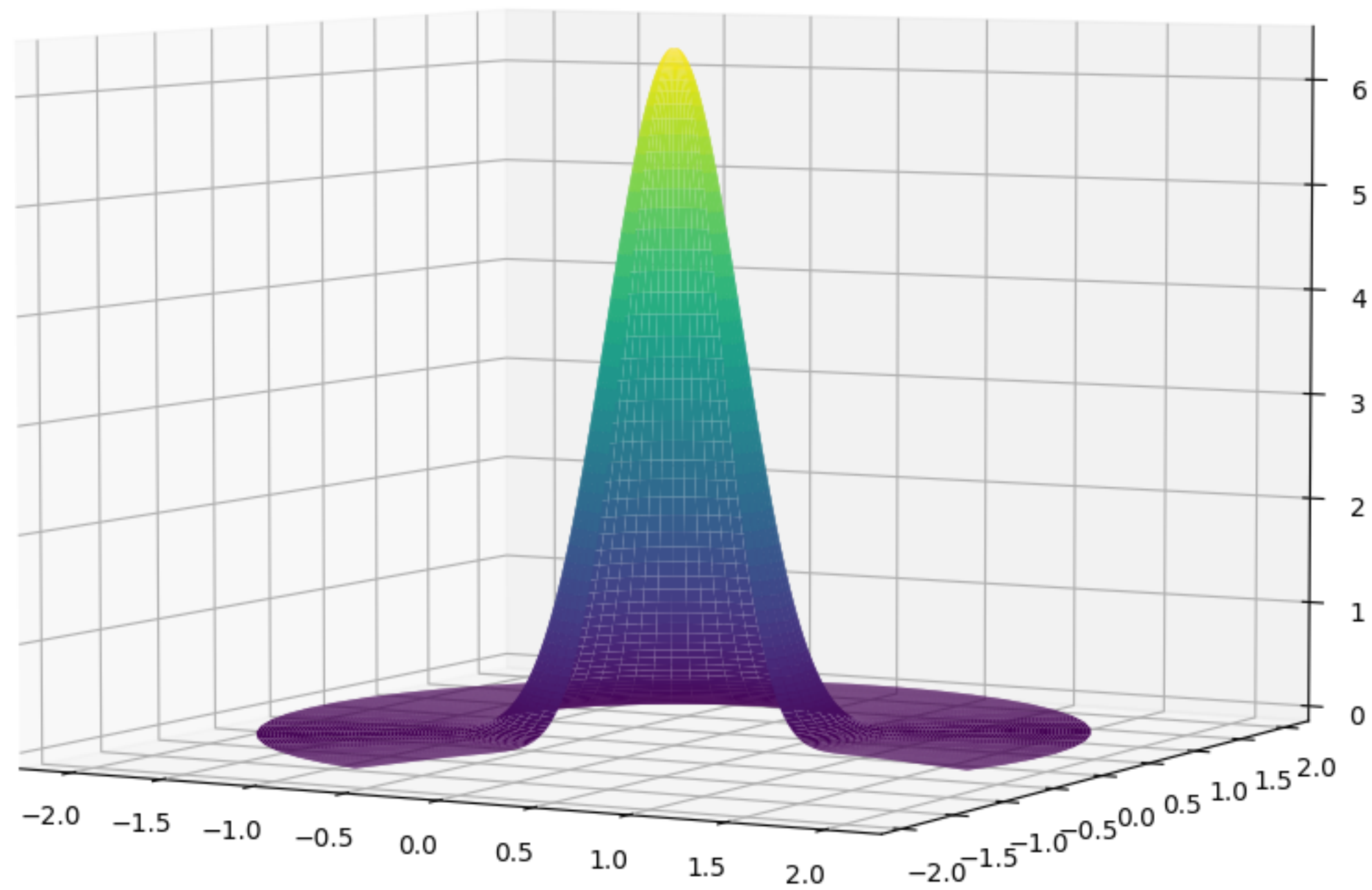
$$\psi(x, y, t = 0)$$

Recap - wave packet with Gaussian amplitude



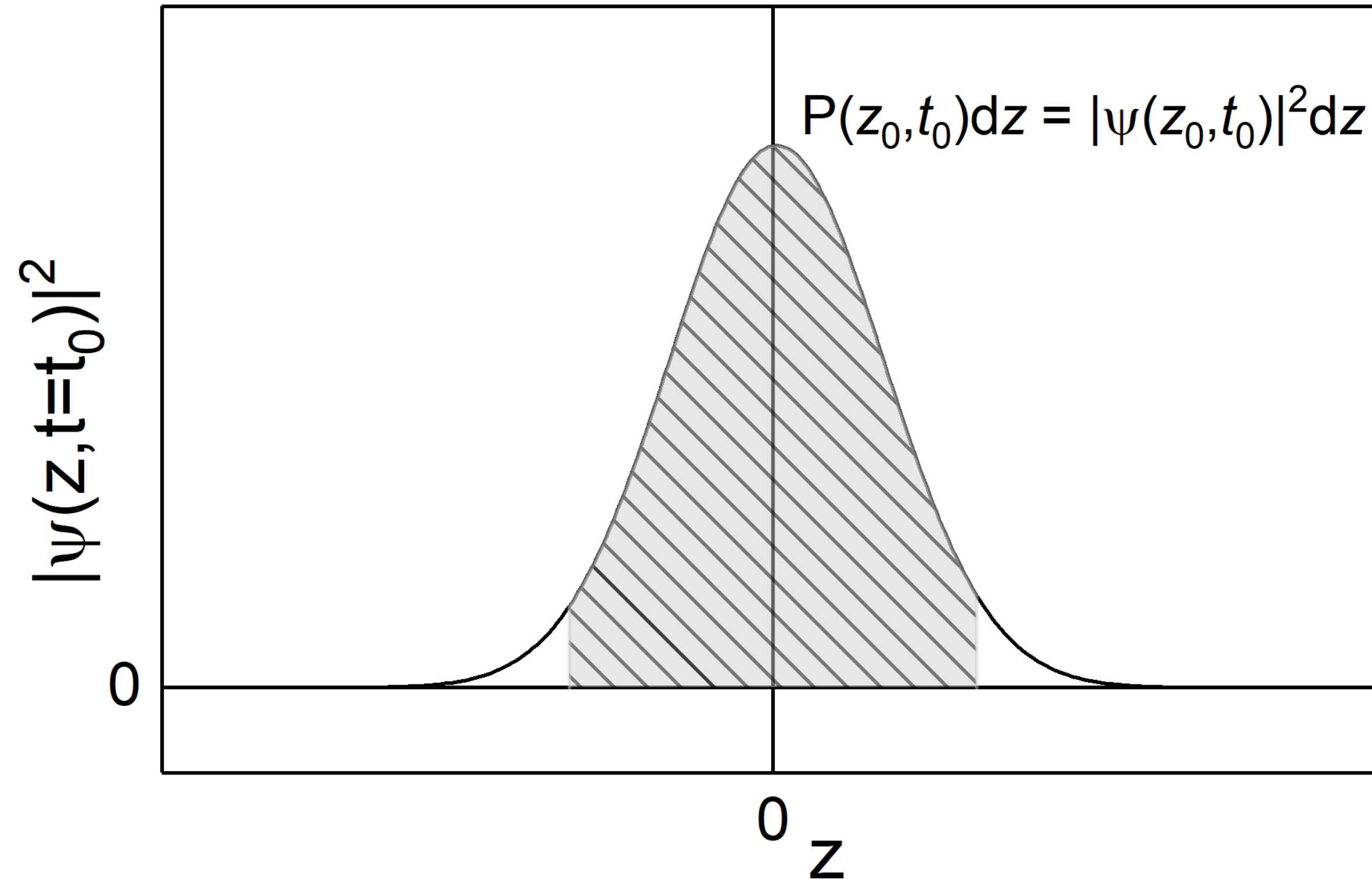
- No side lobes
- No negative values of ψ
- The broader the interval Δk , the narrower the central maximum

Wave packet with Gaussian amplitude and probability density



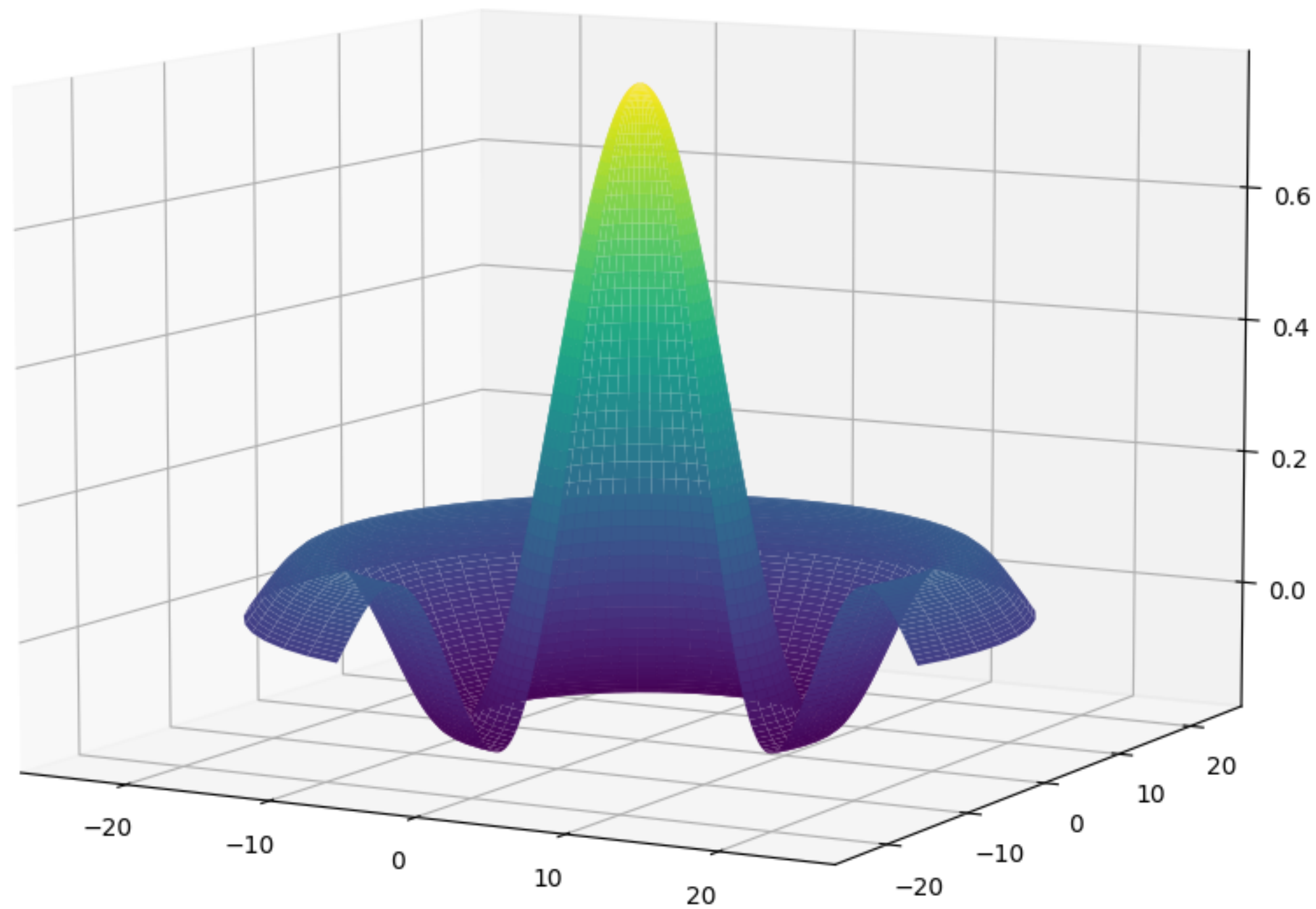
$$\psi(x, y, t = 0)$$

Recap - squared wave function as probability density

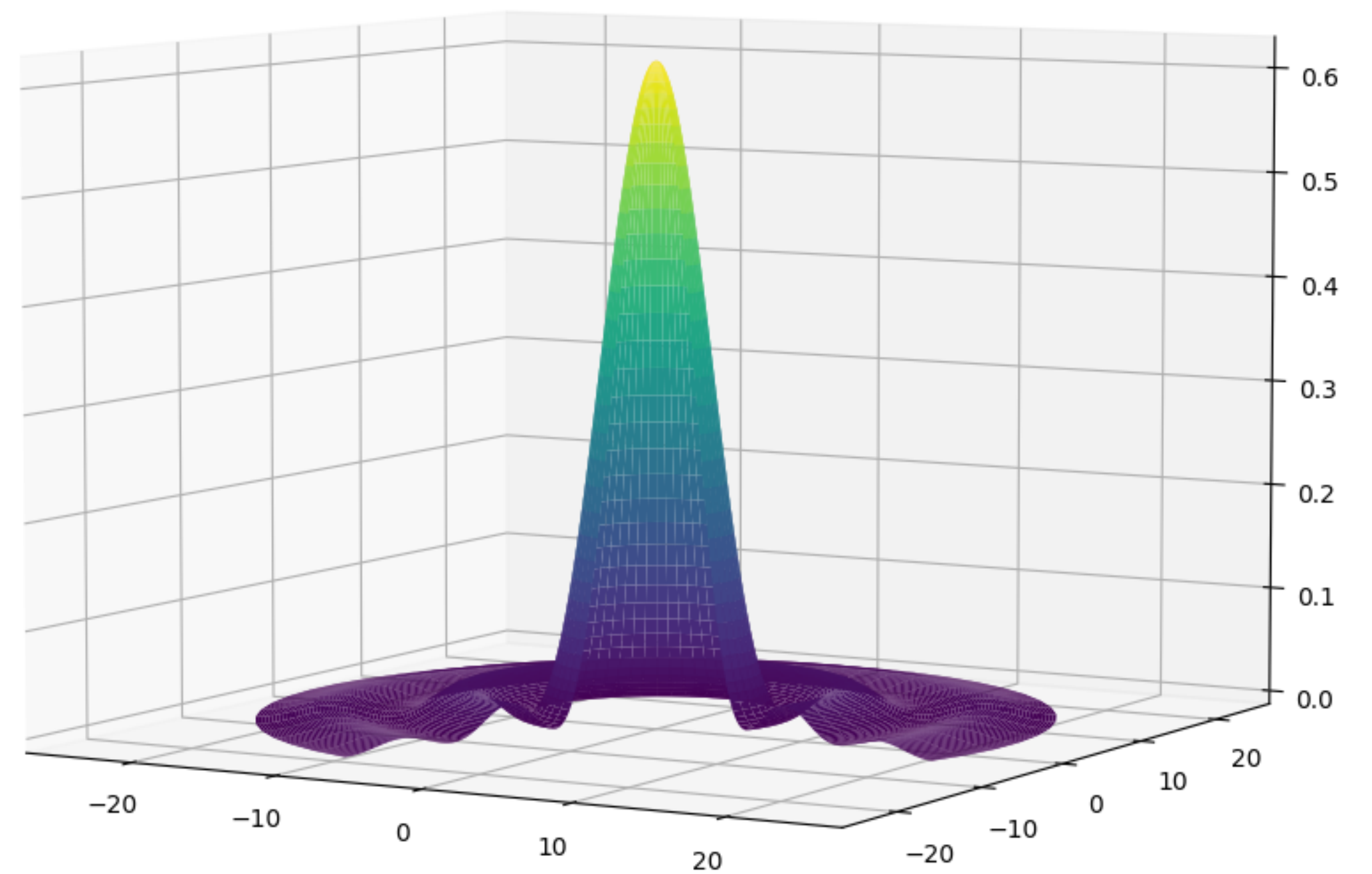


- $|\psi(z, t)|^2$ represents a **probability density**
- Actually physical meaning comes from integrating $|\psi(z, t)|^2$ (physical unit)

Wave packet with constant amplitude and probability density

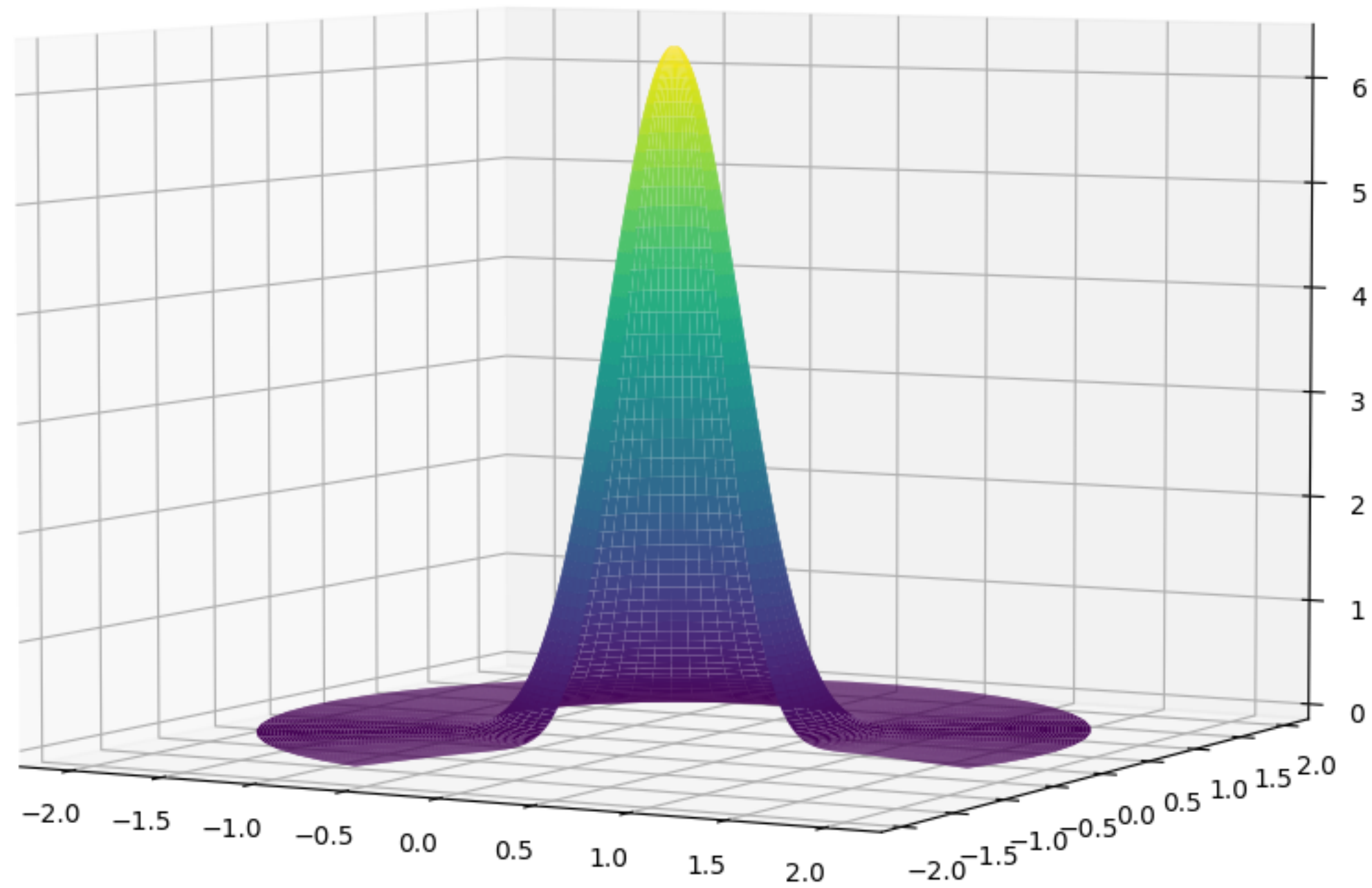


$$\psi(x, y, t = 0)$$

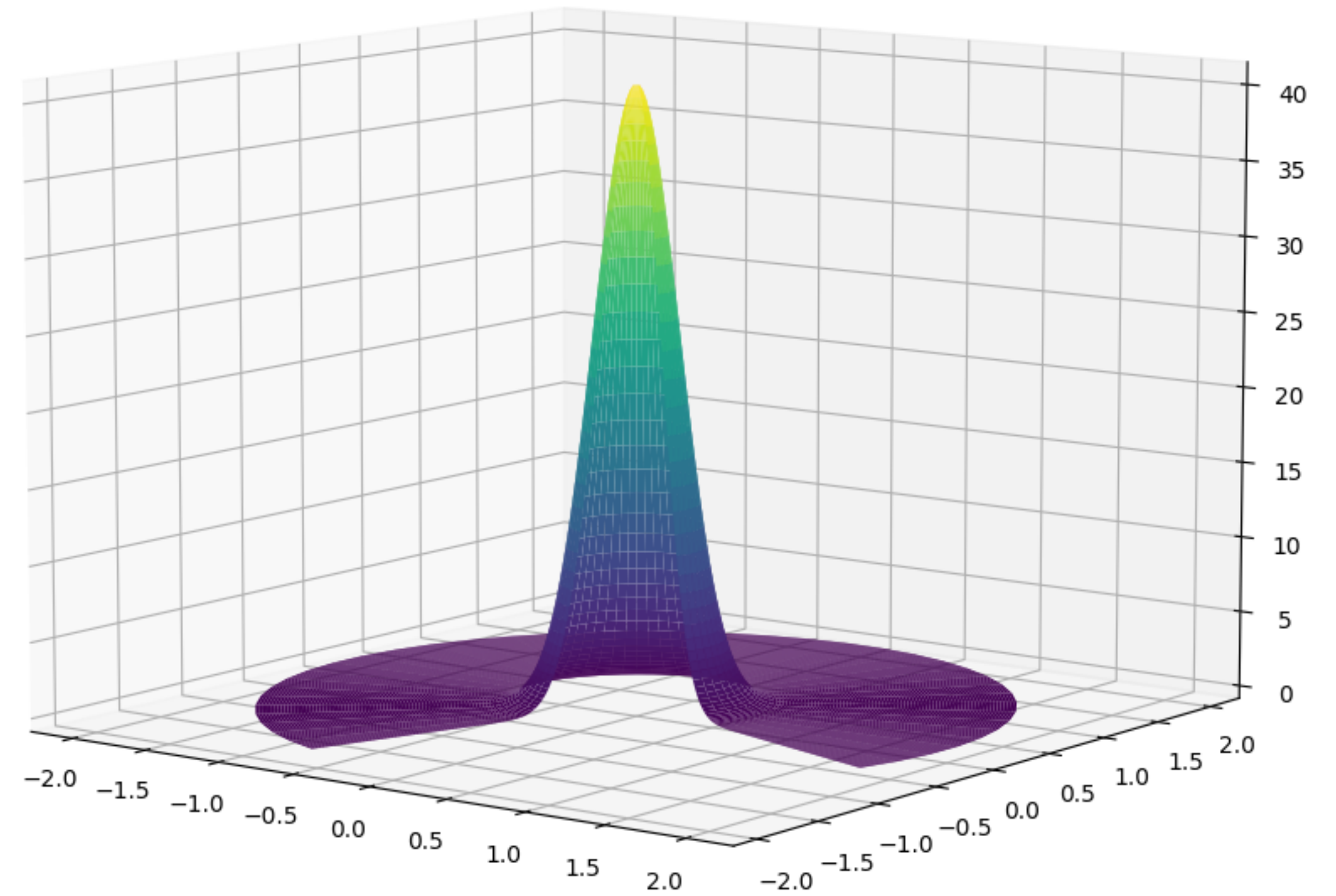


$$\left| \psi(x, y, t = 0) \right|^2$$

Wave packet with Gaussian amplitude and probability density



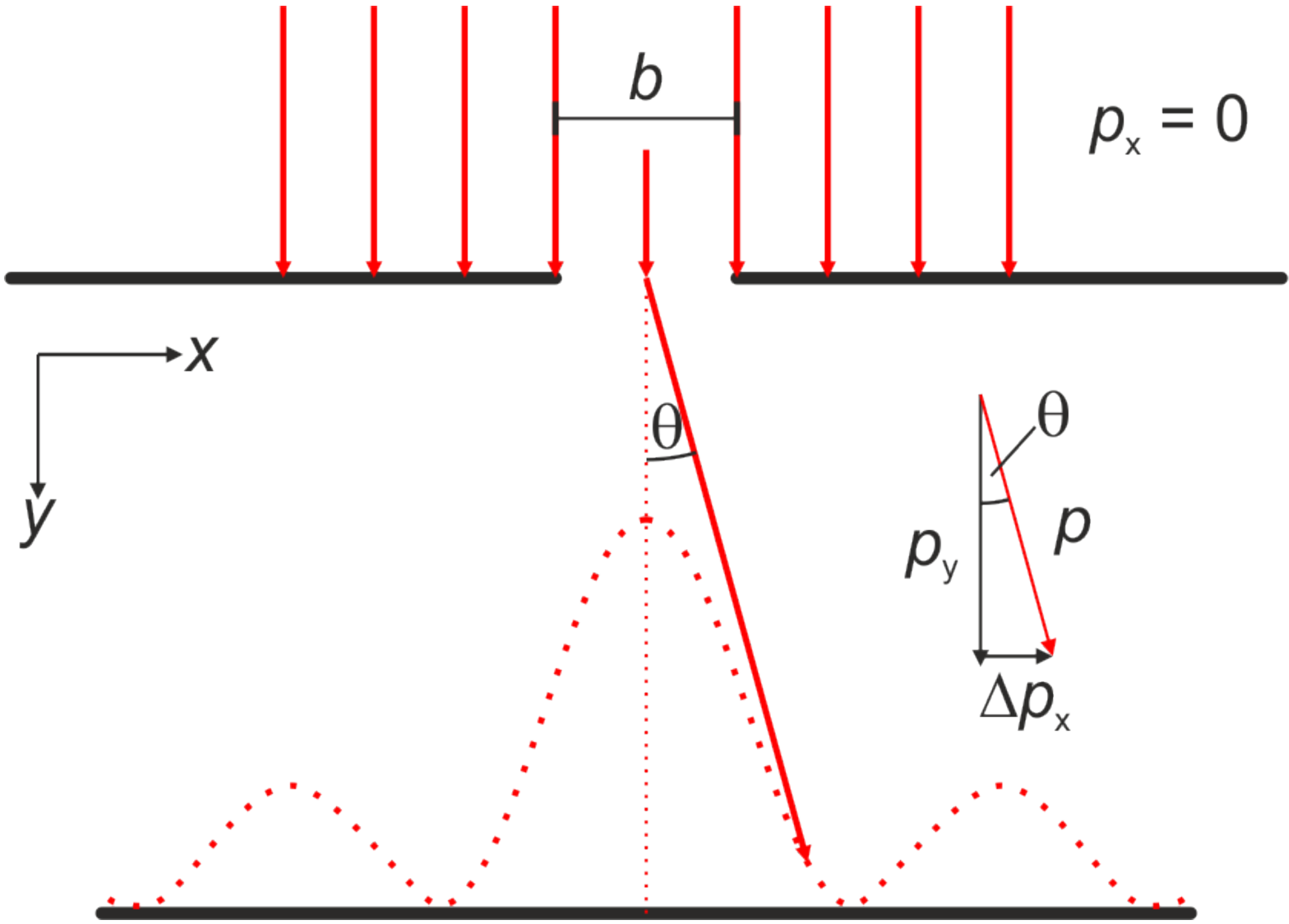
$$\psi(x, y, t = 0)$$



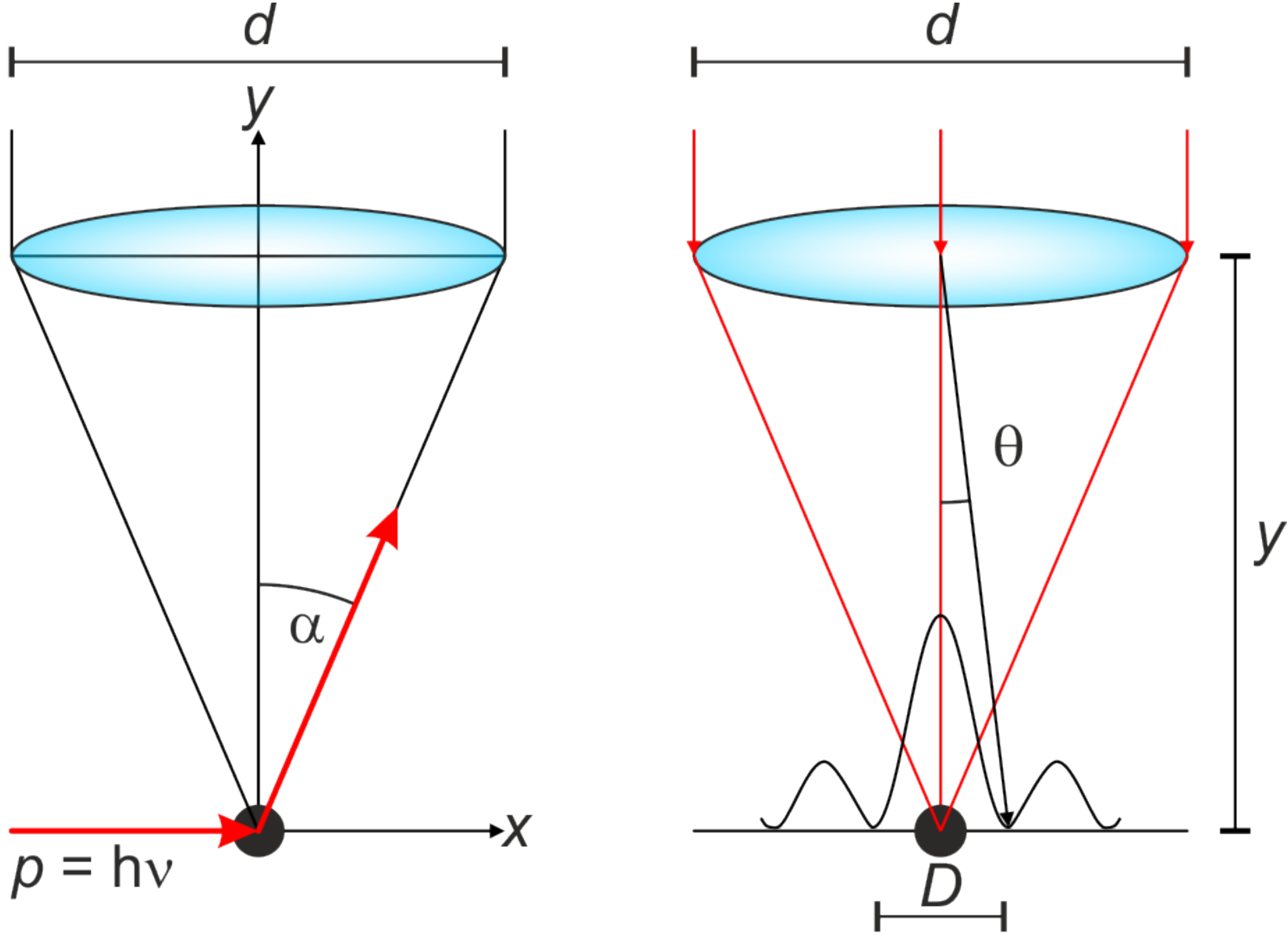
$$\left| \psi(x, y, t = 0) \right|^2$$

Heisenberg's uncertainty principle

Heisenberg's uncertainty principle - electron in a single slit



Heisenberg's uncertainty principle - photon scattered and detected



Heisenberg's uncertainty principle - spreading of a wave packet

