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4. $h(x,y) = e^{-[(x-\alpha)^2+(y-\beta)^2]} \rightarrow H(u,v) = \frac{1}{\pi} e^{-[(u-\alpha)^2+(v-\beta)^2]}$

$f(x,y) = \delta(x-a) \rightarrow F(u,v) = e^{-au}$

$\rightarrow g = h * f \rightarrow G = 2\pi H F \rightarrow g = \sqrt{\pi} h(x,0)\Big|_{x=(x-a)} = \sqrt{\pi} e^{-[(x-\alpha-a)^2]}$!!

with convolution:

$$g = \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} h(x-s, y-t) f(s,t)\, ds\, dt$$

$$= \iint h(x-s, y-t)\, \delta(s-a)\, ds\, dt$$

$$= \int_{-\infty}^{\infty} e^{-[(x-a-\alpha)^2+(y-t-\beta)^2]}\, dt$$

$$= e^{-(x-a-\alpha)^2} \underbrace{\int_{-\infty}^{\infty} e^{-u^2}\, du}_{\sqrt{\pi}} = \sqrt{\pi}\, e^{-(x-a-\alpha)^2} \quad //$$

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