

# 5.73

## Quiz 4 **ANSWERS**

A normalized Gaussian centered at  $x_0$  with variance  $(\Delta x)^2$  is described by

$$G(x; x_0, \Delta x) = (2\pi)^{-1/2} (1/\Delta x) e^{-(x-x_0)^2/[2(\Delta x)^2]}.$$

A. What is the value of the Gaussian function at linecenter,  $x = x_0$ ?

$$G(0; x_0, \Delta x) = (2\pi)^{-1/2} \frac{1}{\Delta x}$$

B. What kind of function is  $[G(x; x_0, \Delta x)]^2$ ?

It is a Gaussian, narrower and taller than  $G(x; x_0, \Delta x)$

C. What is the variance of  $[G(x; x_0, \Delta x)]^2$ ?

The variance is  $(\Delta x)^2/2$

D. What is the center value of  $k$  (i.e.,  $k_0$ ) and the variance of  $k$  for

$$\Psi(x, 0) = (31)^{-3/4} \int_{-\infty}^{\infty} e^{-(49/9)(k-5)^2} e^{ik(x-2)} e^{i5} dk ?$$

$$k_0 = 5$$

$$2(\Delta k)^2 = \frac{9}{49}, \quad (\Delta k)^2 = \frac{9}{98}$$

E. What is the center value of  $x$  (i.e.,  $x_0$ )?

$$x_0 = 2$$

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