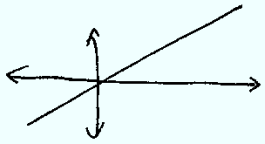
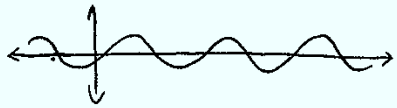
An electron is confined to an infinitely long thin wire (along the x direction). Which of the following is possible for the function ψ describing the electron's state?

A) $\psi(x) = 0$

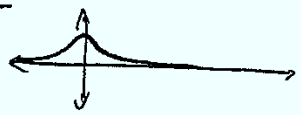
B) $\psi(x) = x$



C) $\psi(x) = \cos(x)$



D) $\psi(x) = 1/\sqrt{\pi(1+x^2)}$



E) All of the above

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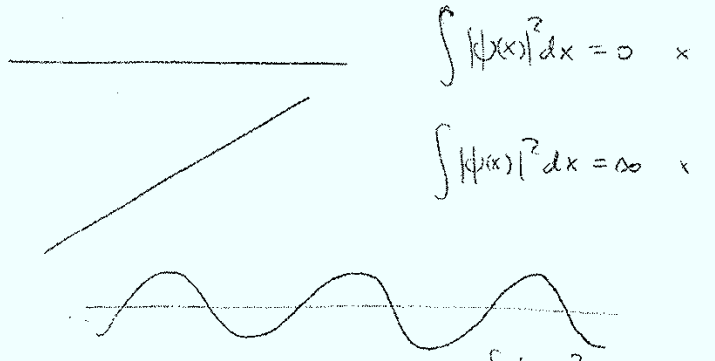


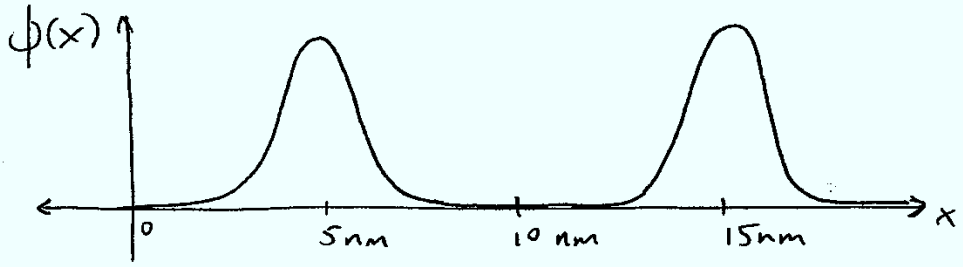
$\int |\psi(x)|^2 dx = 0$ ×

$\int |\psi(x)|^2 dx = \infty$ ×

$\int |\psi(x)|^2 dx = \infty$ ×

$\int |\psi(x)|^2 dx = 1$ ✓

total probability for finding electron must be = 1.



wavefn. for electron(s) in a wire extended along x direction.

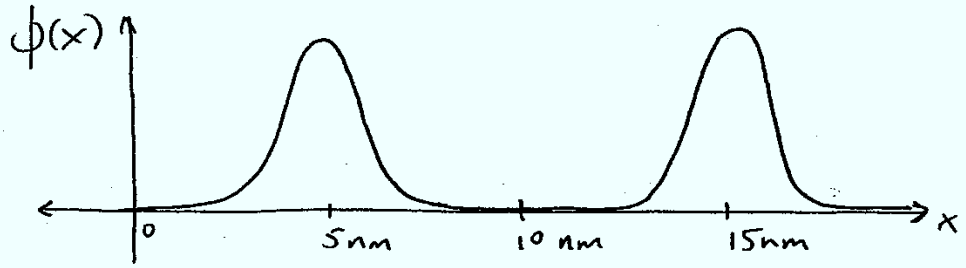
The wavefunction shown represents:

A) An electron near 5nm and an electron near 15nm.

B) A single electron with its charge split into two locations

C) A single electron which does not have a definite location.

D) This is not an allowable wavefunction.



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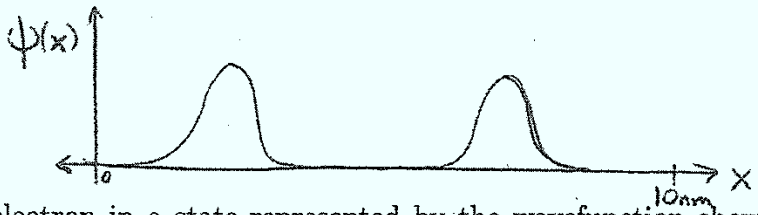
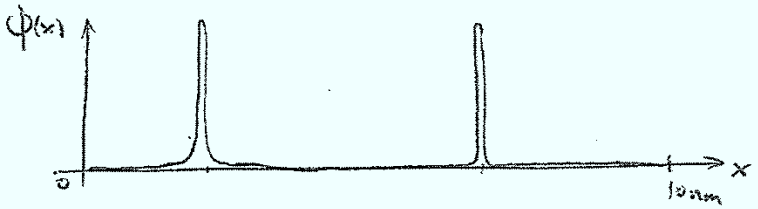
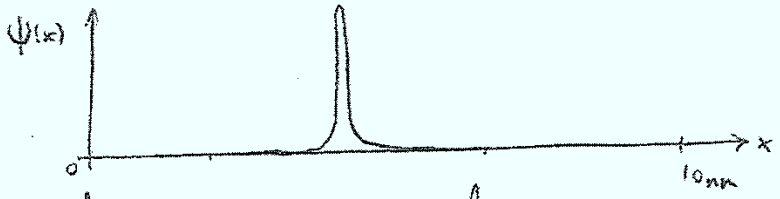


For an electron in a state represented by the wavefunction shown, a measurement of position is performed. Which of the following best represents a possible wavefunction immediately after the measurement?

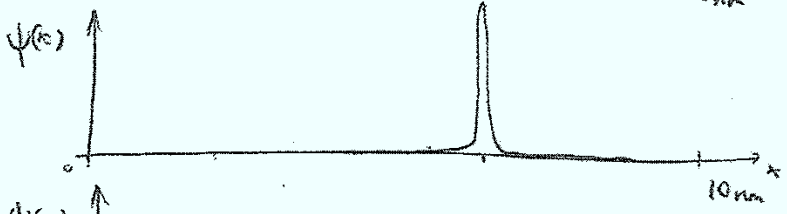
A)



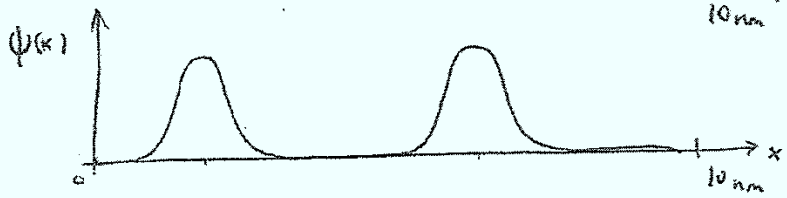
B)



C)

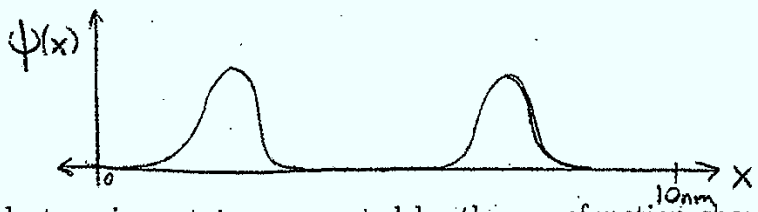


D)



E) Either B or C

assume all wavefunctions are normalized.



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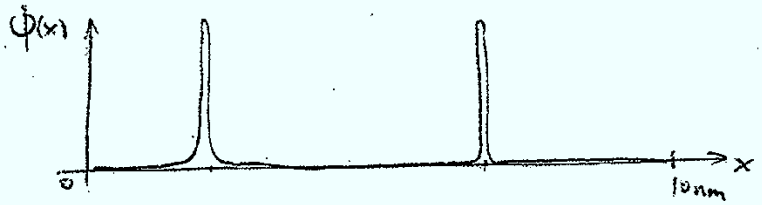
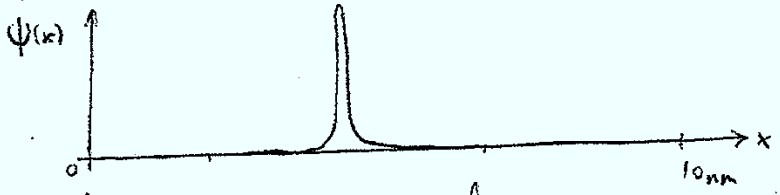
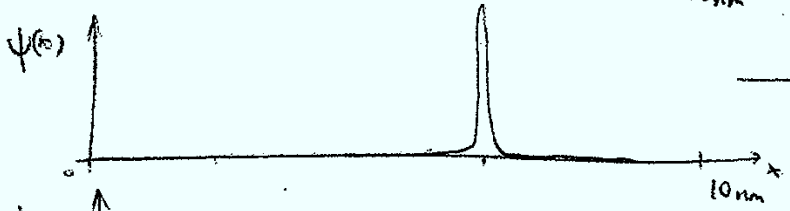
A)


B)


C)


D)


E) Either B or C

assume all wavefunctions are normalized.

becomes position eigenstate
- original ψ(x) determines possible results & probabilities

Problem 4

The figure above represents the photons in a beam of light with some fixed wavelength and intensity. If size represents photon energy in the picture, which of the pictures below best represents a beam of light with the same wavelength but double the intensity?

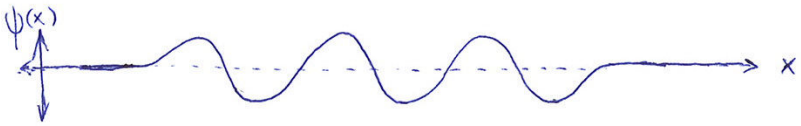
A) 

B) 

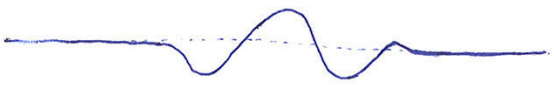
C) 

D) 

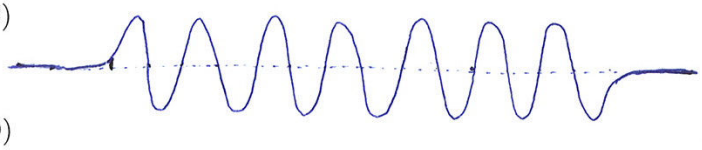
Problem 5



The wavefunction for a traveling electron is described by a wavepacket whose real part is shown above. Which of the following could be the real part of the wavefunction for an electron traveling with double the velocity?

A) 

B) 

C) 

D)