

Animated Plots of $\Psi^*(x,t)$ $\Psi(x,t)$ for Mixed States
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These plots are preliminary and the basis states have not been normalized.

Box States: Infinite square well $-0.5 < x < 0.5$

BoxStates.1+2 $\Psi(x,t) = \Psi_1(x,t) + \Psi_2(x,t)$
 BoxStates.1+3 $\Psi(x,t) = \Psi_1(x,t) + \Psi_3(x,t)$
 BoxStates.1+1.4*2+2 $\Psi(x,t) = \Psi_1(x,t) + 1.4 \Psi_2(x,t) + \Psi_3(x,t)$

Harmonic Oscillator

OscStates.0+1 $\Psi(x,t) = \Psi_0(x,t) + \Psi_1(x,t)$
 OscStates.012 $\Psi(x,t) = \Psi_0(x,t) + \Psi_1(x,t) + \Psi_2(x,t)$
 OscStates.012345 $\Psi(x,t) = .3 \Psi_0(x,t) + .8 \Psi_1(x,t) + \Psi_2(x,t) +$
 $\Psi_3(x,t) + .8 \Psi_4(x,t) + .33 \Psi_5(x,t)$

The following are estimates of various expectation values for the state above.

$\langle x \rangle = 2.152 \cos[\omega t]$ $\langle p \rangle = m \{- 2.152 \omega \sin[\omega t]$
 $\langle x^2 \rangle = 3.0136 + 1.906 \cos[2 \omega t]$
 $\langle p^2 \rangle = (\hbar)^2 \{3.0136 - 1.906 \cos[2 \omega t]\}$
 $\Delta x \Delta p = 0.565 \hbar$ at $t = 0$.

Note that the uncertainty product has local minima when $|\langle x \rangle|$ is a maximum. The uncertainty product 'oscillates' and is somewhat larger at other times.

units: $\text{Sqrt}[\text{Sqrt}[k m]/\hbar] = 1$

***State with no movie

OscStates.012345 $\Psi(x,t) = .38 \Psi_0(x,t) + .76 \Psi_1(x,t) + 1.05 \Psi_2(x,t)$
 $.99 \Psi_3(x,t) + .73 \Psi_4(x,t) + .33 \Psi_5(x,t)$
 $\Delta x \Delta p = 0.535 \hbar$ at $t = 0$.

OscStates.0->10 $\Psi(x,t) = .011 \Psi_0(x,t) + .043 \Psi_1(x,t) + .11 \Psi_2(x,t) +$
 $.224 \Psi_3(x,t) + .37 \Psi_4(x,t) + .52 \Psi_5(x,t) +$
 $.63 \Psi_6(x,t) + .64 \Psi_7(x,t) + .545 \Psi_8(x,t) +$
 $.37 \Psi_9(x,t) + .17 \Psi_{10}(x,t)$
 $\Delta x \Delta p = 0.558 \hbar$ at $t = 0$.

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