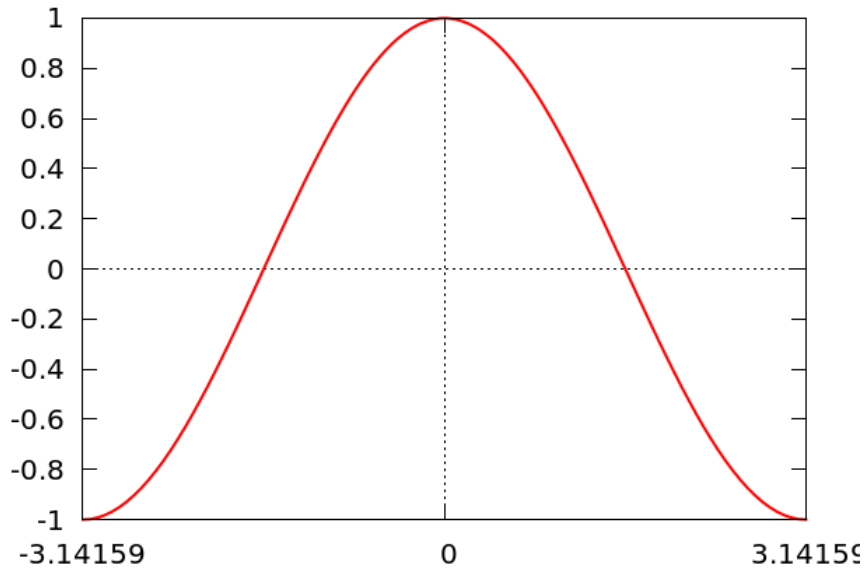


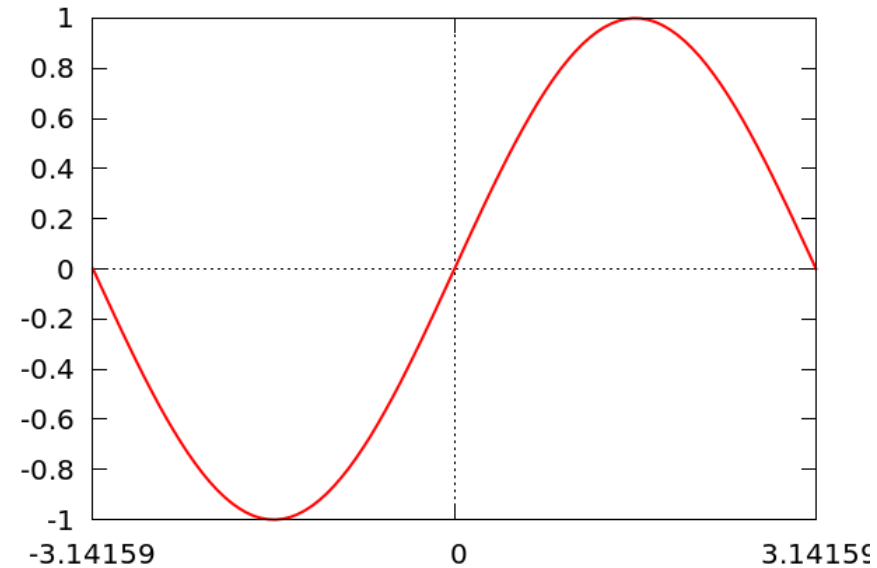
Let us now consider the momentum eigenstates. The real and imaginary parts are shown below.

These are waves. **What do waves do? They interfere. Constructively and destructively.** Here are some shapes one gets purely from wave interference!

cos(x) ———

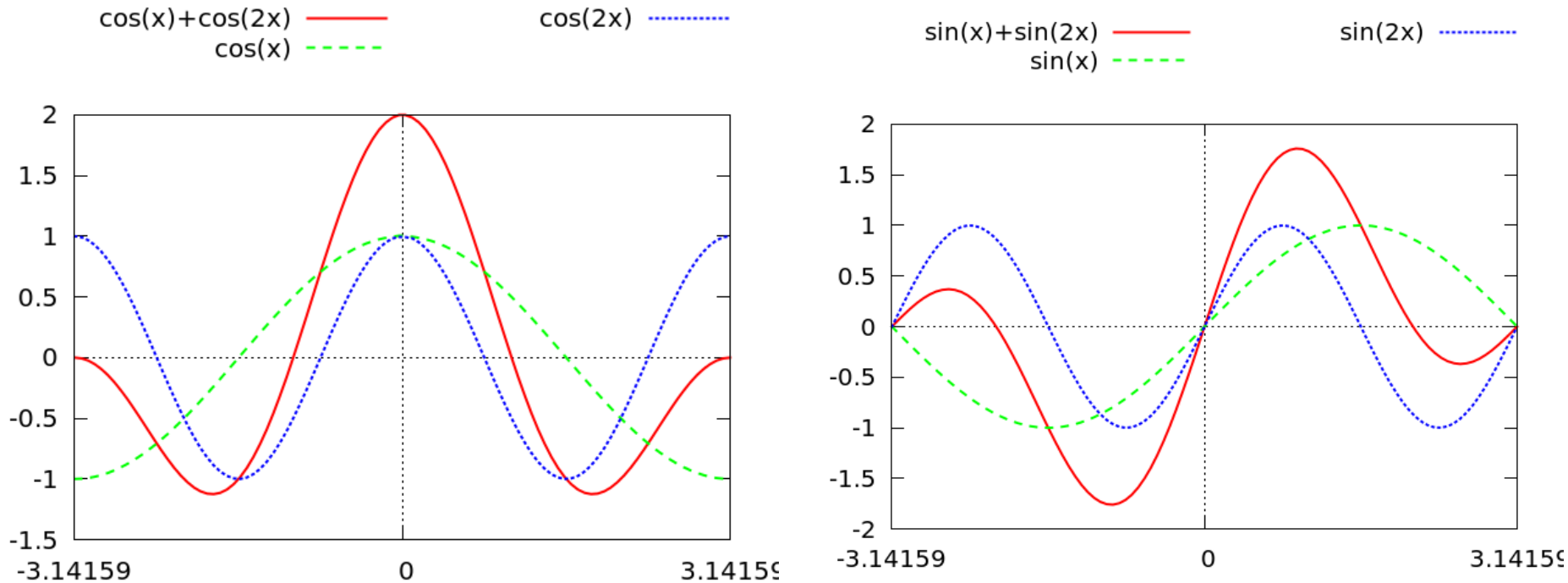


sin(x) ———



The momentum eigenvalue corresponding to this eigenstate is \hbar . Clear why?

What do waves do? Interfere. Constructively and destructively. Here are some shapes one gets purely from wave interference!

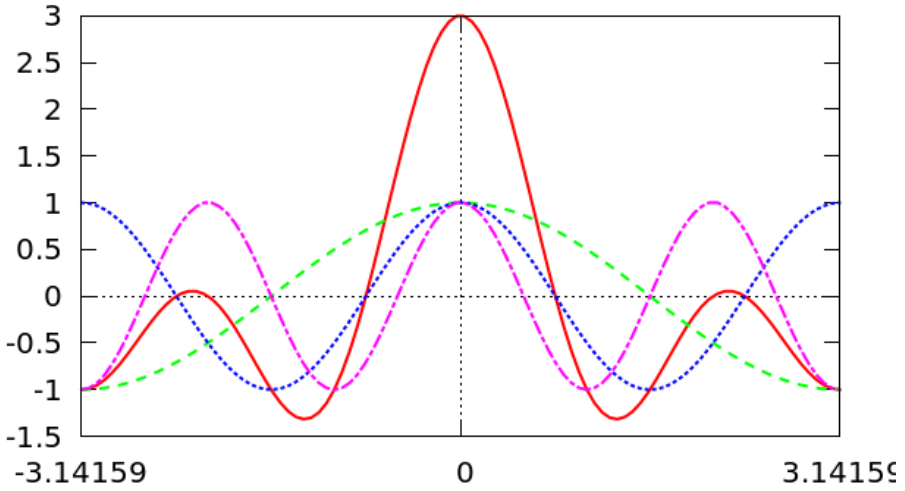


The momentum eigenvalue corresponding to the green wave is \hbar . Blue: $2\hbar$. Clear?

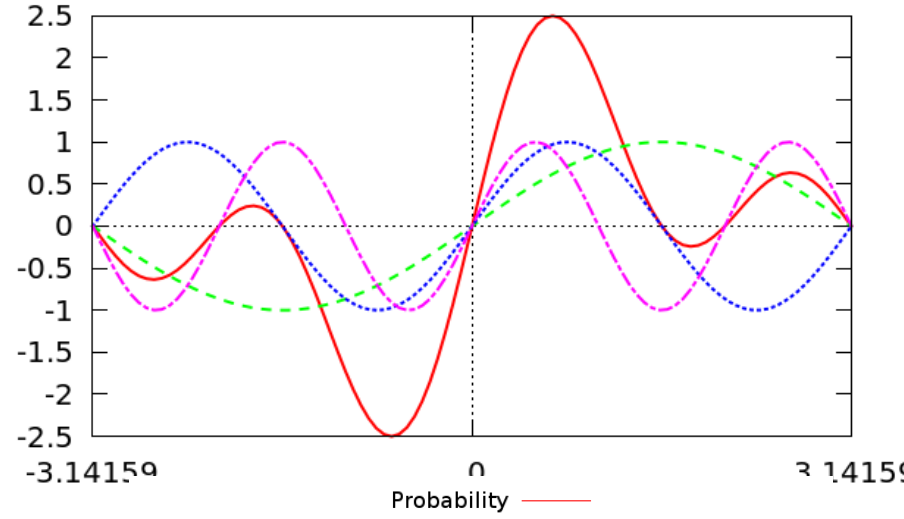
Is the sum an eigenstate of momentum operator? What does this remind you of?

The momentum eigenvalue corresponding to the green wave is \hbar . Blue: $2\hbar$. Magenta: $3\hbar$. Clear? Is the sum an eigenstate of momentum operator?

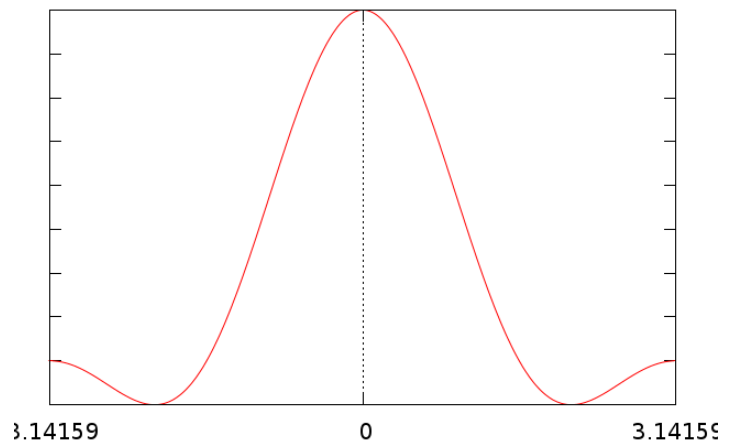
$\cos(x)+\cos(2x)+\cos(3x)$ ——— (red)
 $\cos(x)$ - - - - - (green)
 $\cos(2x)$ ····· (blue)
 $\cos(3x)$ - · - · (magenta)



$\sin(x)+\sin(2x)+\sin(3x)$ ——— (red)
 $\sin(x)$ - - - - - (green)
 $\sin(2x)$ ····· (blue)
 $\sin(3x)$ - · - · (magenta)

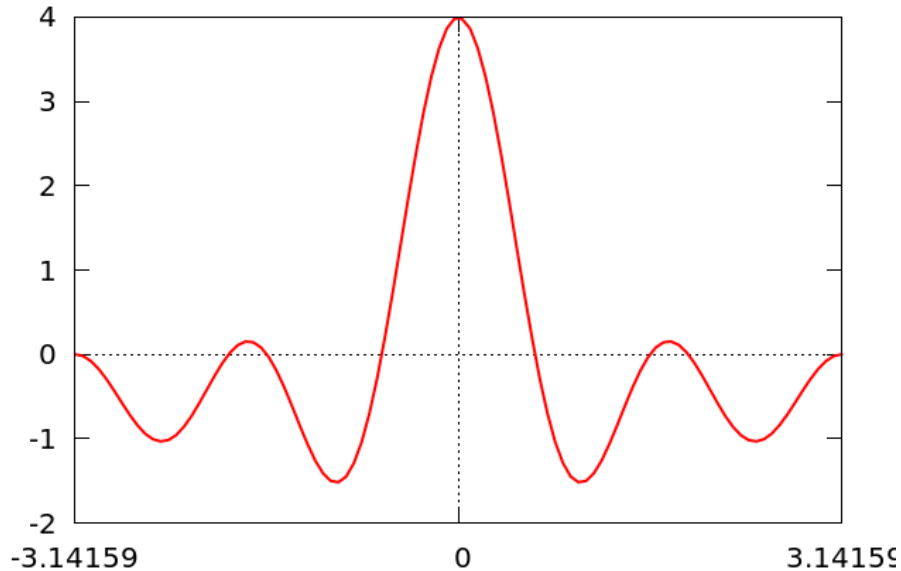


Where is the maximum probability of finding the particle depicted by the red wavefunction?

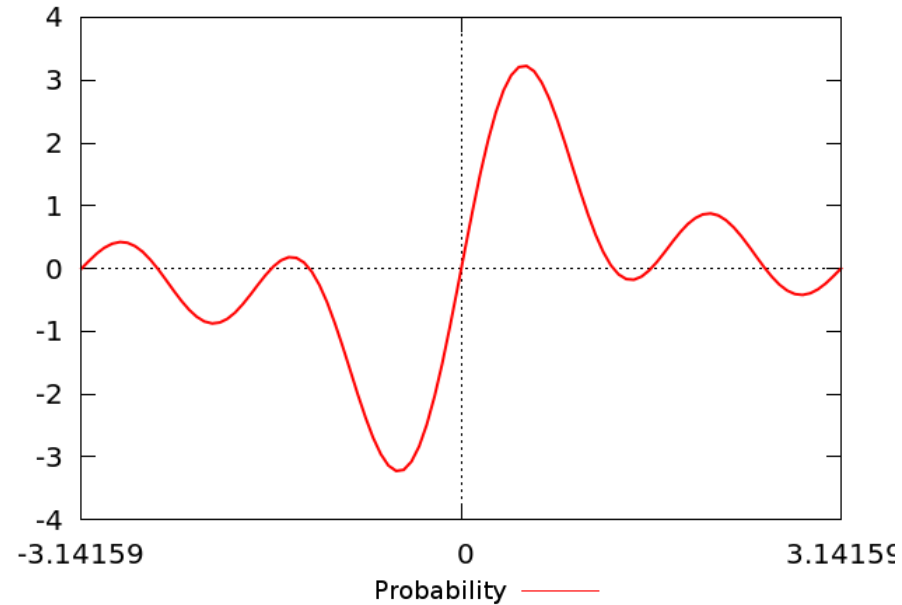


Is the function below an eigenstate of the momentum operator?

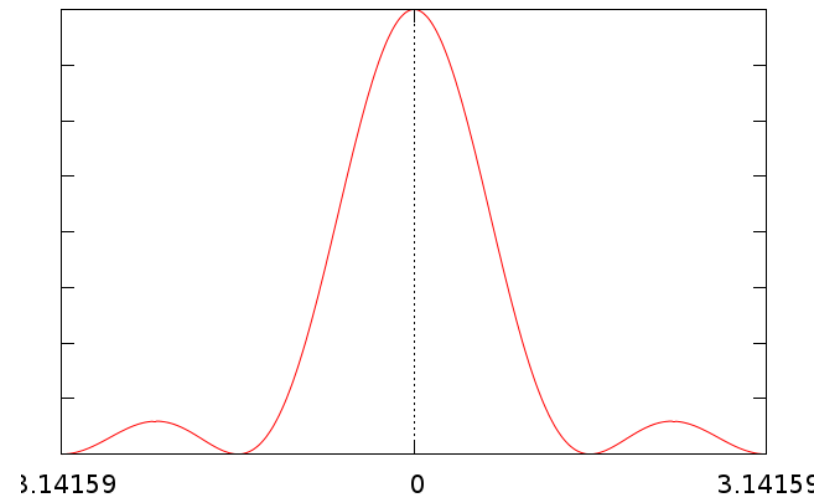
$$\cos(x) + \cos(2x) + \cos(3x) + \cos(4x)$$



$$\sin(x) + \sin(2x) + \sin(3x) + \sin(4x)$$

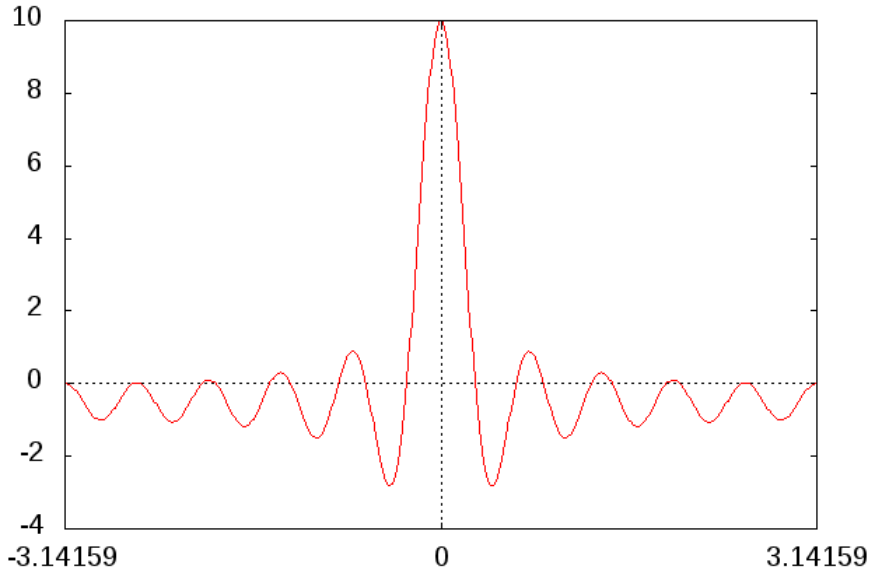


Where is the maximum probability of finding the particle? How does this differ from the previous case?

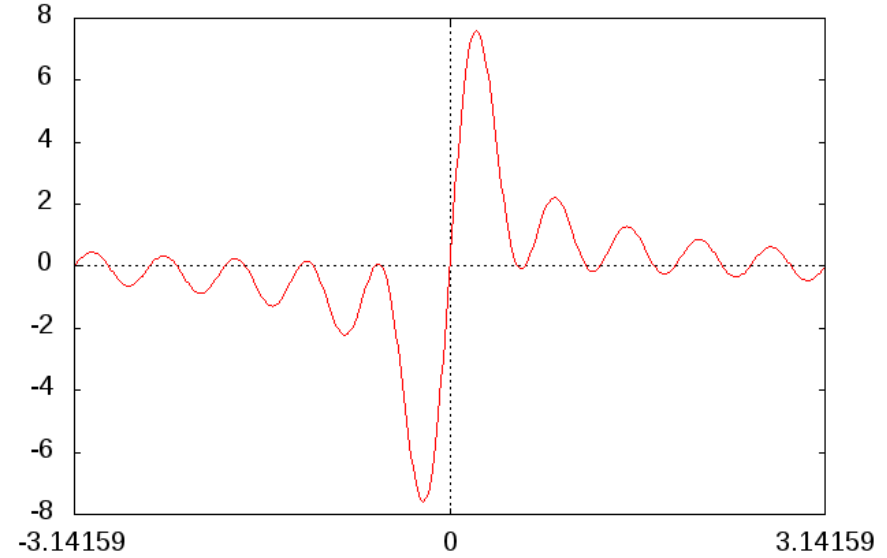


Is the function below an eigenstate of the momentum operator?

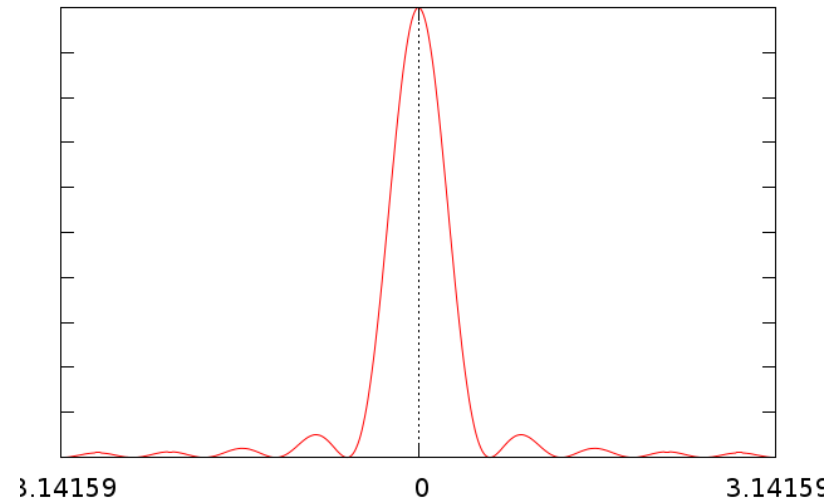
sum[cos(nx),n=1:10] ———



sum[sin(nx),n=1:10] ———



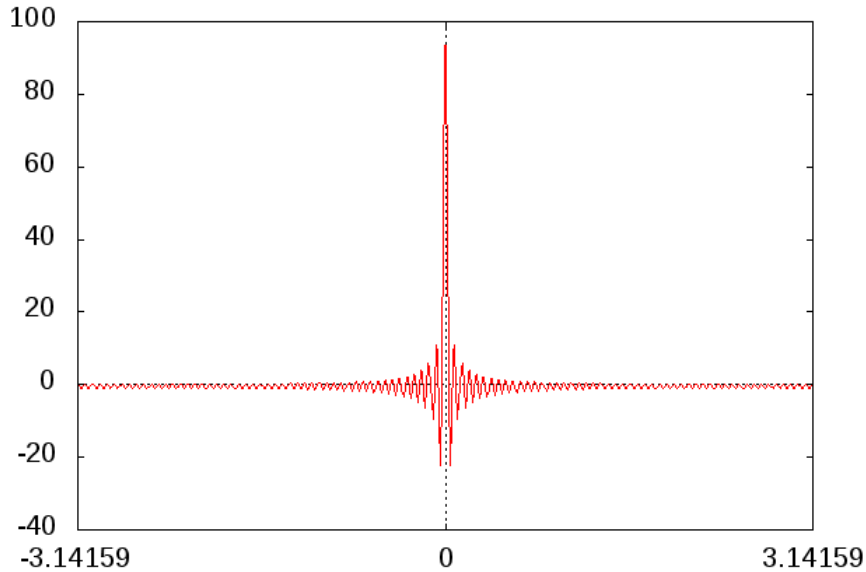
Probability ———



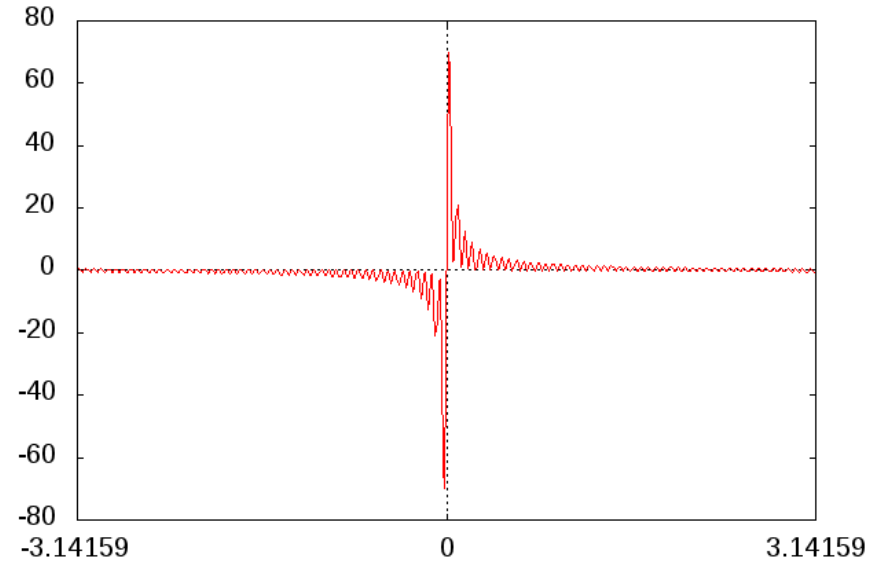
Where is the maximum probability of finding the particle? How does this differ from the previous case?

Is the function below an eigenstate of the momentum operator?

sum[cos(nx),n=1:100] ———



sum[sin(nx),n=1:100] ———



Probability ———

Where is the particle?

When you perform a single momentum measurement, with this state as input, what are the values you could get? (Think Stern Gerlach.)

