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!

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 ħ. Blue: 2ℏ. Magenta: 2ℏ. Clear? Is the sum an eigenstate of momentum operator?

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?

\[ \text{sum}[\cos(nx), n=1:10] \]

\[ \text{sum}[\sin(nx), n=1:10] \]

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?

\[ \sum [\cos(nx), n=1:100] \]

\[ \sum [\sin(nx), n=1:100] \]

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.)