3. Continued...

(b) For roughly what range of n values are the odd coefficients reasonably large?

When $\lambda \sim \frac{a}{100}$ the integrand is small since $\sin\left(\frac{n\pi x}{a}\right)$ varies significantly over the range of integration. $\lambda_n = \frac{2a}{n} \sim \frac{a}{100}$

$\Rightarrow n \simeq 200$ for $c_n = 0$, so the coefficients are large for $n \lesssim 100$.

(c) Is this measurement of x compatible with the uncertainty principle? Explain in terms of your answer to part (b).

just after the measurement $\Delta x \sim \frac{a}{200}$. The possible energies range from $\frac{\hbar^2}{2m}\left(\frac{\pi}{a}\right)^2$ to $\frac{\hbar^2}{2m}\left(100\frac{\pi}{a}\right)^2$. the momenta range to $\sim \pm\hbar\left(\frac{100\pi}{a}\right)$ so $\Delta p \sim \hbar\left(\frac{100\pi}{a}\right)$

$\Delta x \Delta p \sim \frac{a}{200} \times \frac{\hbar 100\pi}{a} = \hbar\frac{\pi}{2}$. Yes