Some typos in Zettili (1st edition) section 1.8

There are two typos that may cause confusion when you are reading the textbook.

1. In equation 1.132,

$$|\psi(x,t)|^2 = \frac{1}{\sqrt{2\pi}\Delta x(t)} \exp\left\{-\frac{(x - v_g t)^2}{[\Delta x(t)]^2}\right\}$$

In equation 1.145,

$$|\psi(x,t)|^2 = \frac{1}{\sqrt{2\pi}\Delta x(t)} \exp\left\{-\frac{(x - v_g t)^2}{[2\Delta x(t)]^2}\right\}$$

$\Delta x(t)$ appears different in the exponent. Both equations are wrong. They should be:

$$|\psi(x,t)|^2 = \frac{1}{\sqrt{2\pi}\Delta x(t)} \exp\left\{-\frac{(x - v_g t)^2}{2[\Delta x(t)]^2}\right\}$$

Only in this form, the width of the Gaussian is $2\Delta x(t)$ and $\Delta x(0)=a/2$ and the earlier convention used by the textbook (equation 1.112) is followed.

2. α is defined as the "dispersive term":

$$\alpha = \frac{1}{2}\frac{d^2\omega}{dk^2}$$

according to equation 1.117.

The definition is consistently used until example 1.9 of page 47. For example, the α's in equations 1.132 and 1.133 follow the above definition.

However, in example 1.9, the author redefines α into completely another thing, according to equation 1.136. All α in this example follows equation 1.136 and has nothing to do with $d^2\omega/dk^2$. Then where has the original α? Since this example is about free particle, so right at the beginning, the authors replace the original α with $\hbar/2m$:

$$\hbar\omega = \frac{\hbar^2 k^2}{2m} \Rightarrow \omega = \frac{\hbar k^2}{2m}$$

$$\therefore \alpha = \frac{1}{2}\frac{d^2\omega}{dk^2} = \frac{1}{2}\frac{d^2}{dk^2}\left(\frac{\hbar k^2}{2m}\right) = \frac{1}{2}\frac{d}{dk}\left(\frac{\hbar k}{m}\right) = \frac{\hbar}{2m}$$

If you made these corrections, then all equations in this sections, are amazingly, correct!