2 (a1). First order upwind:

$S(k) = 1 - \lambda + \lambda \cdot \exp(-ikhx)$ $\quad \lambda = \frac{aht}{hx}$

So For $|s(k)|$ we have Figure 2-a1-1 when $\lambda \le 1$ (CFL)

2-a1-2 when $\lambda > 1$

For V_{ph}

$$V_{ph} = \frac{1}{kht} \ln \frac{S(k)}{|S(k)|}$$

Here we only discuss V_{ph} when $\lambda \le 1$. 2-a1-3

We notice if $\lambda = 1$, No dissipation and no dispersion.