

Insert:

-3.5-

$$O(\epsilon^\alpha): \quad O = -D_c q^2 A - g q^4 A \quad \checkmark$$

At the next order we expect the nonlinear term to come in (note: in comparison with the Ginzburg-Landau derivation from Swift-Hohenberg in class, we are not introducing slow spatial variable. Therefore this additional order at which no solvability condition arose, does not appear here)

$$\begin{aligned} \partial_x \phi \partial_x^2 \phi &= \epsilon^{2\alpha} / A^2 i q (-q^2) e^{2iqx} + 1/A^2 [i g (7q^2 + 6q^4)] \\ &\quad + 1/A^2 [i q (-q^2) + (-iq)(-q^2)] + \\ &\quad + A^{*2} (-iq)(-q^2) e^{-2iqx} \} + q(e^{3\alpha}) \\ &= \epsilon^{2\alpha} \left\{ -iq^3 A^2 e^{2iqx} + \text{c.c.} \right\} + \text{h.o.t.} \end{aligned}$$

need to balance this nonlinear term:

Can do that with B. Do not need C even.

Do not introduce a time derivative at this order.

~~take  $\partial_t A$~~

The time derivative would be

$$\epsilon^{\alpha+\beta} \partial_T A \rightarrow \text{take } \beta > \alpha$$