

### Srednicki Problem 1.3

From

$$U(\Lambda)^{-1} P^\mu U(\Lambda) = \Lambda^\mu_\nu P^\nu \quad (1)$$

I have to end up with

$$[P^\mu, M^{\sigma\rho}] = i\hbar(g^{\mu\sigma} P^\rho - (\rho \leftrightarrow \sigma)) \quad (2)$$

So using  $\Lambda = 1 + \delta\omega$ , we have:

$$U(\Lambda)^{-1} = I - \frac{i}{2\hbar} \delta\omega_{\mu\nu} M^{\mu\nu} \quad (3)$$

which follows from  $U^{-1}U = I$  and the given,

$$U(\Lambda) = I + \frac{i}{2\hbar} \delta\omega_{\mu\nu} M^{\mu\nu}. \quad (4)$$

Putting everything in, and working to first order in  $\delta\omega$ , I end up with

$$\frac{i}{2\hbar} \delta\omega_{\sigma\rho} [P^\mu, M^{\sigma\rho}] = \delta\omega^\mu_\nu P^\nu \quad (5)$$

I am stuck here.