

FIG. 1: Deep Inelastic Scattering Amplitude Modulus Squared

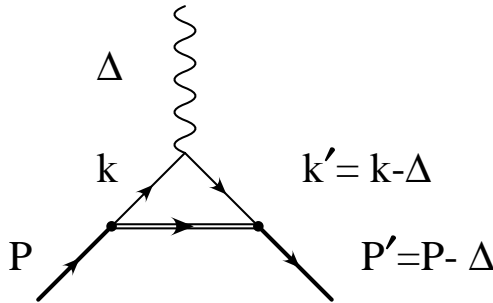


FIG. 2: Quark-diquark model of nucleon form factor

### Homework 4

#### Level 1

1) Consider the following components for the incoming proton in the Infinite Momentum Frame (IMF), for the process represented in Figure 1:

$$P \equiv \left( P + \frac{M^2}{2P}; \mathbf{0}, P \right)$$

- By taking  $x$  as the momentum fraction carried by the struck quark, what are the components of the struck quark, and the remaining  $X$  system?
- Write the covariant propagator for the struck quark.
- By using the decomposition showed in class, write the Time Ordered (TO) denominators corresponding to the covariant propagator. Which one of the TO diagrams governs the process?

#### Level 2

2) Consider a quark-diquark model for the proton form factor (see Figure 2).

We now have three vertices: write down all the possible TO diagrams corresponding to the covariant diagram in the figure.

By taking similar components as in Problem 1), can you tell which one of the diagrams will dominate in this case?