

## SHORT HW 2: Momentum Flow

COURSE: Physics 165, *Introduction to Particle Physics* (2020)

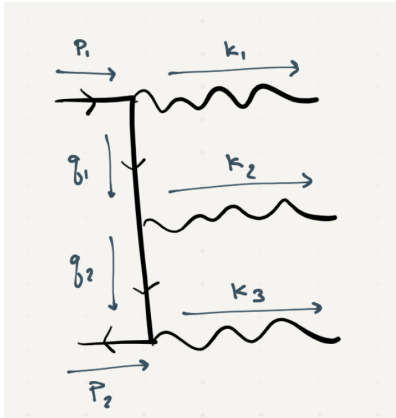
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DUE BY: **Thursday**, January 30

Note that this short assignment is due in class on Thursday. You have only *two days* to do it. This should be quick, I recommend doing it right after class on Tuesday.

### 1 Total Momentum Conservation for a $2 \rightarrow 3$ process

In class we drew the following diagram for  $e^+e^- \rightarrow 3\gamma$ .



Using the conservation of four-momentum at each vertex, show that the total four-momentum is conserved. That is, prove:

$$(p_1 + p_2)^\mu = (k_1 + k_2 + k_3)^\mu . \quad (.1)$$

HINT: Start by writing the conservation of four-momentum at each vertex. Those are three equations with unspecified  $q_1^\mu$  and  $q_2^\mu$ . Use two equations to determine what these virtual momenta are, then plug them into the last equation to prove the above relation.