Bilkent University, Department of Physics

**PHYS 453: Nuclear & Particle Physics**

Second Midterm Examination

Duration: 70 minutes   **Date:** 13 April 2012

1. (25 points) For the $e^- - e^-$ scattering, consider the ladder diagram contribution shown below. Applying Feynman QED rules, write down the amplitude for this diagram, and carry out all delta function integrations. Leave your expression with a single four-dimensional integration (use q for this final remaining variable). Keep the spinors, i.e., no use of Casimir's trick.
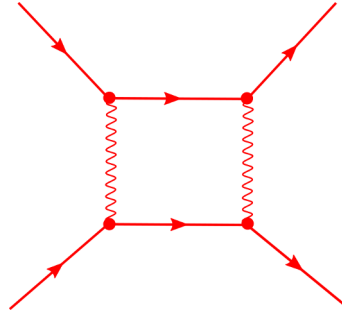
2. (15 points) Prove that $\{\gamma^5, \gamma^\mu\} = 0$.

3. (10 points) Simplify $\not{p}\not{p}$.

Remarks:

- Open notes, books, laptops

- No internet, or exchange of resources during the exam

- Give all details of your work in a neat presentation