Task 1:
Select from one of the following five geometries (1 per group). For each geometry the green area represents the part, black regions are inserts, red circles indicate vents, and gray squares injection gates.

Automotive fender:
Window frame:

Multiple insert geometry:
Task 2:
Using LIMS, select the best gate (gray square) and vent (pink circle) combination in order to achieve minimum void content and minimum fill time. Be sure not to sacrifice part quality for faster filling. Use your best judgment to achieve the proper balance. The mesh and node numbers for all gates and vents will be provided. During the experiment, you will be using the same fabric as used during the permeability characterization exercise, so use those permeability values. Repeat the simulations for weak race-tracking and strong race-tracking before you decide your best possible gate and vent.

Task 3:
Sign up for a session to manufacture the part with the injection scheme you selected. You will cut the required fabric layers, place them in the mold, seal the mold, and infuse the resin into the preform. The flow progression will be captured with a video camera to analyze the results later. For purposes of safety and convenience, diluted and dyed corn syrup will be used instead of curing resin.

Task 4:
Compare the experimental results to those predicted by simulation. Do they match? Do they differ? Why or why not? Pay attention to overall fill time as well as the flow progression pattern. If the experiment differed from the simulation, repeat the simulation making all appropriate adjustments to mimic the experiment. Can you justify the assumption made?

Task 5:
Discuss your results. Address the following issues:
1. How can simulation be used to improve manufacturing?
2. What shortcomings can occur in the simulation that can result in inaccurate flow prediction?
3. Do these shortcomings render simulation useless? Why or why not?
4. Potential flow deviations occurred during the experiment. This may have resulted in an otherwise ideal gate and vent combination to not fill the mold entirely. What can be done to deal with this issue? Pose at least two well thought out solutions.
5. What other obstacles may occur when manufacturing composite parts using Resin Transfer Molding?

One report per group will be fine.

Submit:
1. All input data used along with values and locations of racetracking in the geometry.
2. All flow front pictures from LIMS along with the arguments for choice of gate and vent.
3. Figure of Cut Preform in the Mold
4. Experimental Flow Front Information
5. Deviations of Flow in Experiment with that in Simulation. Devise a quantitative way to compare the flow front information
6. Adjustments made in the simulations to mimic experiments
7. Snap shots of adjusted simulation along with experimental snap shots side by side
8. Discussion of questions posed in Task 5
9. Contribution of each group member in the project
10. Five minute presentation to be done in class discussing the above