Mathematics 4530
Assignment 11, due November 19, 2013

Read Sections 54 and 55. Then do:

- pp. 347–348: 1, 2, 6, 8 [For 6 I suggest that you ignore the hint and just use properties of the exponential function.]
- p. 353: 1, 2, 4 (all parts except (e))

Additional problem (extra credit, only because it assumes some group theory):

This exercise puts Theorem 54.6 in its proper group-theoretic context. The intention is that you should do it *without* using that theorem. Let $p\colon E \to B$ be a covering map with E path connected.

(a) Given $b \in B$, use path lifting to define a right action of $\pi_1(B, b)$ on the fiber $p^{-1}(b)$.

(b) Show that the action is transitive and that the stabilizer of a point $e \in p^{-1}(b)$ is $p_*\big(\pi_1(E, e)\big)$.

(c) Deduce that the cardinality of the fiber is equal to the index of $p_*\big(\pi_1(E, e)\big)$ in $\pi_1(B, b)$.