

**Math 527 - Homotopy Theory**  
**Spring 2013**  
**Homework 3, Lecture 1/30**

**Problem 2.** Let  $f: X \rightarrow Y$  be a map of spaces, and  $x \in X$  any basepoint. Show that the induced map

$$\pi_n f: \pi_n(X, x) \rightarrow \pi_n(Y, f(x))$$

for  $n \geq 1$  is a map of  $\pi_1$ -modules, in the sense that it is  $\pi_1 f$ -equivariant. More precisely, for any  $\gamma \in \pi_1(X, x)$  and  $\theta \in \pi_n(X, x)$  the equation

$$(\pi_n f)(\gamma \cdot \theta) = (\pi_1 f)(\gamma) \cdot (\pi_n f)(\theta)$$

holds in  $\pi_n(Y, f(x))$ .