16 | Cellular Approximation Theorem

16.1 Definition. Let X, Y be CW complexes. A map $f\colon X \to Y$ is *cellular* if $f(X^{(n)}) \subseteq Y^{(n)}$ for all $n \geq 0$.

16.2 Cellular Approximation Theorem. *Let X, Y be CW complexes. For any map $f\colon X \to Y$ there exists a cellular map $g\colon X \to Y$ such that $f \simeq g$. Moreover, if $A \subseteq X$ is a subcomplex and $f|_A\colon A \to Y$ is a cellular map then g can be selected so that $f|_A = g|_A$ and $f \simeq g$ (rel A).*

16.3 Theorem. *Let X be a CW complex and let $x_0 \in X^{(2)}$. The inclusion map $i\colon X^{(2)} \to X$ induces an isomorphism $i_*\colon \pi_1(X^{(2)}, x_0) \to \pi_1(X, x_0)$.*