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# Assignment 7
# Hand in date: December 04, 2018

**Exercise 1.** *Hand in your solution to Exercise* 4.10 *from the notes on categorical logic.*

**Exercise 2.** *Hand in your solution to Exercise* 4.14 *from the notes on categorical logic.*

**Exercise 3.** *Hand in your solution to Exercise* 5.3 *from the notes on categorical logic.*

**Exercise 4.** *Let* $\left(X, \left(\overset{i}{=}\right)_{i=0}^{\infty}\right)$ *be a complete ordered family of equivalences,* $\{x_i\}_{i=0}^{\infty}$ *and* $\{y_i\}_{i=0}^{\infty}$ *two Cauchy sequences in* $X$*, and* $n \in \mathbb{N}$.

*Show that if* $x_i \overset{n}{=} y_i$ *for all* $i \in \mathbb{N}$ *then*

$$\lim_{i\to\infty} x_i \overset{n}{=} \lim_{i\to\infty} y_i.$$

**Exercise 5.** *Let* $X$ *and* $Y$ *be two complete ordered families of equivalences and let* $X$ *be inhabited. Let* $f : Y \times X \to X$ *be a non-expansive function such that for all* $y \in Y$ *the function* $f(y, -) : X \to X$ *is* contractive.

*Show that there exists a unique* non-expansive *function* $g : Y \to X$ *such that* $f(y, g(y)) = g(y)$.