4.13 This is a classic that is hard until you know the "trick".

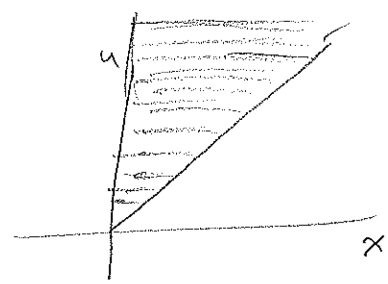
Note that $u = \int_0^u 1 \, dx$

Now; for X non-negative:

$$E(X) = \int_0^\infty u f_X(u) \, du$$

$$= \int_0^\infty \left[\int_0^u dx \right] f_X(u) \, du$$

$$= \int_0^\infty \int_0^u f_X(u) \, dx \, du$$



change order of integration.

$$= \int_0^\infty \int_x^\infty f_X(u) \, du \, dx$$

$$= \int_0^\infty \left[F_X(u) \right]_x^\infty dx$$

$$= \int_0^\infty \left[1 - F_X(x) \right] dx$$

Note: 4.8 is similar using trick $k = \sum_{u=1}^{k} 1$