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continuous images of path connected spaces are path connected

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Proposition. *The continuous image of a path connected space is path connected.*

Proof. Let X be a path connected space, and suppose f is a continuous surjection whose domain is X. Let a and b be points in the image of f. Each has at least one preimage in X, and by the path connectedness of X, there is a path in X from a preimage of a to a preimage of b. Applying f to this path yields a path in the image of f from a to b. $\square$