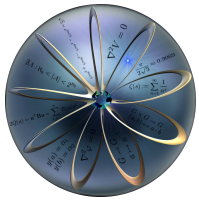

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alternate integral representation of beta function

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By making the change of variable $x^p = y$, we see that

$$\int_0^1 x^{p-1}(1-x)^{q-1}\,dx = \frac{1}{p}\int_0^1 (1-y^{\frac{1}{p}})^{q-1}\,dy.$$

Hence, we have

$$\int_0^1 (1-y^{\frac{1}{p}})^{q-1}\,dy = p\frac{\Gamma(p)\Gamma(q)}{\Gamma(p+q)}.$$