Use natural logs to solve.

$3^{x+6} = 5^{x-1}$

$\ln 3^{x+6} = \ln 5^{x-1}$

$(x+6)\ln 3 = (x-1)\ln 5$

$(x+6)1.0986 = (x-1)1.6094$

$1.0986x + 6.5916 = 1.6094x - 1.6094$

$-1.0986x \quad +1.6094 \quad -1.0986x \quad +1.6094$

$\frac{8.2010}{.5108} = \frac{.5108x}{.5108}$

$16.0552 \approx x$

Convert to natural log & evaluate

$\log_8 24$

$\frac{\ln 24}{\ln 8} \approx 1.5283$