Precalculus

Basic exponent equation of type $c^{px+q} = Ad^{rx+s}$

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Example

Solve.

$$
\begin{aligned}
3^{2x+5} &= 5 \cdot 2^{-x+1} && \text{Common base} \\
\left(2^{\log_2 3}\right)^{2x+5} &= 5 \cdot 2^{-x+1} && a = b^{\log_b a} \\
2^{(\log_2 3)(2x+5)} &= 5 \cdot 2^{-x+1} && \\
\frac{2^{(\log_2 3)(2x+5)}}{2^{-x+1}} &= 5 && \\
2^{(\log_2 3)(2x+5)-(-x+1)} &= 5 && \text{Apply } \log_2 \\
(\log_2 3)(2x+5) + x - 1 &= \log_2 5 && \\
x\,(2\log_2 3 + 1) + 5\log_2 3 &= \log_2 5 + 1 && \\
x &= \frac{\log_2 5 + 1 - 5\log_2 3}{2\log_2 3 + 1} && \\
x &\approx -1.1038 && \text{Calculator}
\end{aligned}
$$