Precalculus
Exponent equation that reduces to masked quadratic, part 2

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Example (Exponential equation that reduces to quadratic)

Solve the equation.

$$
\begin{aligned}
3^{2x} &= 2 + 63 \cdot 3^{-2x} && \text{>2 terms $\Rightarrow$ transfer one side} \\
3^{2x} - 2 - 63 \cdot 3^{-2x} &= 0 && 3^{2x} = u \\
u - 2 - 63u^{-1} &= 0 && 3^{-2x} = \left(3^{2x}\right)^{-1} = u^{-1} \\
u^2 - 2u - 63 &= 0 && \text{Multiply } \cdot u \\
(u-9)(u+7) &= 0 \\
u - 9 = 0 \quad &\text{or} \quad u + 7 = 0 \\
u = 9 \quad &\text{or} \quad u = -7 \\
3^{2x} = 9 \quad &\text{or} \quad \text{no real solution} \\
2x = \log_3 9 & \\
2x = 2 & \\
x = 1 &
\end{aligned}
$$