

Question 8

Solve the equation:

$$5^{x+1} = 2^{3x-2}$$

Instructions: Solve the equation algebraically using logarithms. Provide both an exact expression and an approximate value rounded to 3 decimal places.

Question 8 - Solution

Taking natural logarithms (both sides are positive) gives

$$(x + 1) \ln 5 = (3x - 2) \ln 2.$$

Collect the terms in x and divide by their nonzero coefficient:

$$x = \frac{-\ln 5 - 2 \ln 2}{\ln 5 - 3 \ln 2} \approx 6.374.$$

The logarithm is one-to-one, so solving this equivalent linear equation introduces no extraneous solutions. The exact expression verifies the original equation.