Assignment 3 Problem 4

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Consider the following integral:
$\int_0^{\pi/2} \frac{sin^n(x)}{sin^n(x)+cos^n(x)} dx$ where n is any positive integer.

(a) *Use Wolfram Alpha or another computer algebra system to evaluate the above integral (for a general n). Write down the result.*
Standard computational time exceeded.

(b) *Using a computer algebra system, evaluate the above integral for* $n = 1, 4, 7$.
For $n = 1$:
$\int_0^{\pi/2} \frac{sin(x)}{sin(x)+cos(x)} dx = \frac{\pi}{4}$

For $n = 4$:
$\int_0^{\pi/2} \frac{sin^4(x)}{sin^4(x)+cos^4(x)} dx = \frac{\pi}{4}$

For $n = 7$:
$\int_0^{\pi/2} \frac{sin^7(x)}{sin^7(x)+cos^7(x)} dx = \frac{\pi}{4}$

(c) *Evaluate the integral by hand as follows.*

(i) Rewrite the integral using the substitution $u = \frac{\pi}{2} - x$.