Question **1**

Correct

Marked out of 16

(*Secant Method*). All numerical answers should be rounded to 7-digit floating-point numbers. Given a real number $z$, the symbol $\tilde{z}$ denotes the result of rounding of $z$ to a 7-digit floating-point number.

(i) Apply the Secant method to find an approximation $p_N$ of the solution of the equation

$$\frac{x-\sin(x)}{1-\cos x}=0.69$$

in $[\pi/2,\pi]$ satisfying

$$\mathrm{RE}(\tilde{p}_N \approx \tilde{p}_{N-1}) < 10^{-6}$$

by taking $p_0 = 2.6$ and $p_1 = 2.8$ as the initial approximations.

(ii) Show your work by filling the following standard output table for the Secant method (if a particular row is not necessary, please type an asterisk $*$ in each input field of that row):

| $n$ | $p_{n-2}$ | $p_{n-1}$ | $p_n$ | $\mathrm{RE}(\tilde{p}_n \approx \tilde{p}_{n-1})$ |
|---|---|---|---|---|
| 2 | 2.6 ✔ | 2.8 ✔ | 2.009835 ✔ | 0.3931492 ✔ |
| 3 | 2.8 ✔ | 2.009835 ✔ | 1.8736 ✔ | 0.07271296 ✔ |
| 4 | 2.009835 ✔ | 1.8736 ✔ | 1.837149 ✔ | 0.01984107 ✔ |
| 5 | 1.8736 ✔ | 1.837149 ✔ | 1.835829 ✔ | 0.0007190212 ✔ |
| 6 | 1.837149 ✔ | 1.835829 ✔ | 1.835819 ✔ | 5.44716e-06 ✔ |
| 7 | 1.835829 ✔ | 1.835819 ✔ | 1.835819 ✔ | 0 ✔ |
| 8 | * ✔ | * ✔ | * ✔ | * ✔ |
| 9 | * ✔ | * ✔ | * ✔ | * ✔ |
| 10 | * ✔ | * ✔ | * ✔ | * ✔ |

(ii) According to your results in (i) and (ii),

$p_N \doteq$ 1.835819 ✔ .

Check

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