

Reminder: All counting variables must be of `INTEGER` datatype.

- 1) (2 pts) Write an F90 program that will tabulate the sine and cosine functions on the interval $[0^\circ, 45^\circ]$ in steps of 5° .
- 2) (4 pts) Write an F90 program that will tabulate the function below for $x \in [0, \pi]$. Use $n = 15$.

$$f(x) = \begin{cases} x^2 + x - 2 & \text{for } 0 \leq x < \frac{\pi}{4} \\ \sin(x) & \text{for } \frac{\pi}{4} \leq x < \frac{\pi}{2} \\ \cos(x + 4.3) & \text{for } \frac{\pi}{2} \leq x \leq \pi \end{cases}$$

- 3) (5 pts) Suppose you need to generate a set of $n + 1$ equally spaced points on some interval of the x -axis, $[a, b]$, given the values of a, b and the number of subdivisions, n . There are 2 ways to do this:

Method 1:

```

h = (b-a)/n
x = a
DO i = 2,n+1
  x = x + h
ENDDO

```

Method 2:

```

h = (b-a)/n
DO i = 1,n+1
  x = a + (i-1)*h
ENDDO

```

Test both methods using the values $a = -\frac{\pi}{2}$, $b = \frac{\pi}{3}$ and $n = 123456789$. For both cases, compute the relative error in the value of x once the loop terminates (this should be equal to b). Which method is more accurate (*i.e.*, which method has the smaller relative error)? Explain why the more accurate method has the lower relative error.