

Essential Mathematics

Week 8 Exercises

Following the examples and using Julia complete the following:

1. Find, by Newton's method, an approximate root of the function

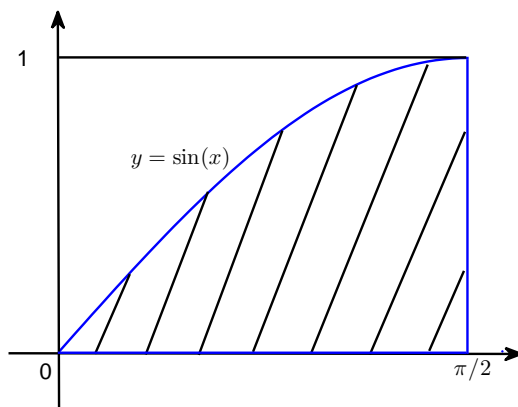
$$f(x) = e^{x+\sin(x+1)} - \sqrt{3},$$

starting from initial guess $x_0 = 1$ and prosecuting 5 iterations (work out x_5).

(**HINT:** $f'(x) = (1 + \cos(x+1))e^{x+\sin(x+1)}$, $x_{i+1} = x_i - \frac{f(x_i)}{f'(x_i)}$)

Solution: $x_5 = -0.181093345230863$

2. Estimate, using Monte-Carlo method with 10,000 and 100,000 random points in rectangle $[0, \pi/2] \times [0, 1]$ (i.e. $0 \leq x \leq \pi/2$, $0 \leq y \leq 1$), the area of the region that is below $y = \sin(x)$, above the x axis, and between $x = 0$ and $x = \pi/2$ (see figure below)



True Area= 1