

Solve  $x = \cos(x)$  using Newton's method.

We iterate using the equation

$$x \leftarrow x - \frac{r(x)}{r'(x)},$$

where

$$r(x) = x - \cos(x) \quad \text{and} \quad r'(x) = 1 + \sin(x).$$

The results of the iteration with an initial guess of 0.0:

Iteration 0:  $x = 0.000000000000001$ ,  $r(x) = -1$

Iteration 1:  $x = 0.000000000000001$ ,  $r(x) = 0.4596976941318603$

Iteration 2:  $x = 0.000000000000001$ ,  $r(x) = 0.0189230738221173$

Iteration 3:  $x = 0.000000000000001$ ,  $r(x) = 0.0000464558989907$

Iteration 4:  $x = 0.000000000000001$ ,  $r(x) = 0.0000000002847205$

Iteration 5:  $x = 0.000000000000001$ ,  $r(x) = -0.0000000000000001$

And the approximate answer is 0.7390851332151606.