BIS 420 PROGRAMMING FOR DATA SCIENCE

PRAJAKTA POHARE
CHAPTER 7 EXERCISE 7.3
ILLINOIS STATE UNIVERSITY

To test the square root algorithm in this chapter, you could compare it with math.sqrt. Write a function named test_square_root that prints a table like this:

1.0 1.0 1.0 0.0

2.0 1.41421356237 1.41421356237 2.22044604925e-16

3.0 1.73205080757 1.73205080757 0.0

4.0 2.0 2.0 0.0

5.0 2.2360679775 2.2360679775 0.0

6.0 2.44948974278 2.44948974278 0.0

7.0 2.64575131106 2.64575131106 0.0

8.0 2.82842712475 2.82842712475 4.4408920985e-16

9.0 3.0 3.0 0.0

The first column is a number, a; the second column is the square root of a computed with the function from Section 7.5; the third column is the square root computed by math.sqrt; the fourth column is the absolute value of the difference between the two estimates.

Output:

```
import math


def square_root(a):
    x = a
    while True:
        y = (x + a / x) / 2
        if abs(y - x) < 1e-10:
            return y
        x = y


def test_square_root():
    print(f"{'a':<5} {'sqrt(a)':<15} {'math.sqrt(a)':<15} {'diff':<15}")
    for a in range(1, 10):
        sqrt_a = square_root(a)
        math_sqrt_a = math.sqrt(a)
        diff = abs(sqrt_a - math_sqrt_a)
        print(f"{a:<5} {sqrt_a:<15} {math_sqrt_a:<15} {diff:<15}")


test_square_root()
```

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```python
import math

def square_root(a):
    x = a
    while True:
        y = (x + a / x) / 2
        if abs(y - x) < 1e-10:
            return y
        x = y

def test_square_root():
    print(f"{'a':<5} {'sqrt(a)':<15} {'math.sqrt(a)':<15} {'diff':<15}")
    for a in range(1, 10):
        sqrt_a = square_root(a)
        math_sqrt_a = math.sqrt(a)
        diff = abs(sqrt_a - math_sqrt_a)
        print(f"{a:<5} {sqrt_a:<15} {math_sqrt_a:<15} {diff:<15}")

test_square_root()
```