CS 3320 Homework
Module 7 – Chapter 7
Optimization

1. (10 pts) Problem 7.2

2. (10 pts) Problem 7.5 – Do it by hand for two iterations (not three).

3. (10 pts) Problem 7.6 – Do it by hand for two iterations (not three).

4. (20 pts) Implement the Golden Search algorithm for finding a local minimum in a given interval. The basic algorithm is shown in Figure 7.7 in the book. However, it has some efficiencies. Python is the preferred language of this assignment. Your function should have the following signature:

```
golden(func, left, right, tol)
```

`func`: function to find the minimum
`left`: left end value of the interval
`right`: right end value of the interval
`tol`: Tolerance of the absolute relative error for ending the algorithm, i.e.,

$$(1 - r)\frac{x_{right} - x_{left}}{|x_{opt}|} < tol \text{ where } r = \frac{\sqrt{5}-1}{2}.$$

The improvement that you will make is that you will only use r (or ϕ) once at the beginning of the algorithm to find the original shifting distance, d. Finding the subsequent distance, d, for a new interval is a matter of subtraction.

Test your algorithm on $\frac{x^2}{10} - 2\sin(x)$ with an initial interval of [0, 4] and a tolerance of machine epsilon. Report where the minimum is and the number of function evaluations in finding the minimum.