Problem 3

$$f(x) = 7sin(x) - e^x = 0 \qquad (1)$$

Given initial guesses: $x_{-1} = 0.5, x_0 = 0.4$.

Thus, we will use secant method to find roots.

The Output

```
>> T3_20110065(0.5, 0.4, 10e-6)

ans =

    0.1702
```

Figure 1: The output of f(x).

But, how do we know if it's the least positive root? Well, we can divide the f(x) (from (1)) by x-0.1702 and see if the secant method converges to any other root. (We check sign change first to ensure that root isn't quadratic in fig-2).

```
>> x = 0.1

x =

    0.1000

>> 7*sin(x)-exp(1)^x

ans =

    -0.4063
```

```
>> x = 0.2

x =

    0.2000

>> 7*sin(x)-exp(1)^x

ans =

    0.1693
```

Figure 2

We get fig-3.

```
>> T3_20110065(0.5, 0.4, 10e-6)

ans =

    1.8931
```

Figure-3

Clearly, 1.8931 is far more farther from 0.4 and 0.5 than the origin. Thus, there can't be any other positive root closer to origin.

Hence, x=0.1702 is the least positive root.