Lab2Simons.m

Table of Contents


```
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```

Problem 1

Perform four different fixed-point iteration methods of computing 25^(1/3)

```
fixedPointIterationA();
fixedPointIterationB();
fixedPointIterationC();
fixedPointIterationD();

fprintf('\nMethods in order from fastest convergence to slowest: ');
fprintf('B, D, A\n');
fprintf('NB: Method C does not converge to a sufficient approximation
\n\n');
```

```
n: 135 p135: 2.7589241758 |error|: 0.0000000001
n: 9 p9:   2.7589241764 |error|: 0.0000000001
n: 2 p2:   0.0000000000 |error|: 0.0000000001
n: 37 p37:  2.7589241764 |error|: 0.0000000001

Methods in order from fastest convergence to slowest: B, D, A
NB: Method C does not converge to a sufficient approximation
```

Problem 2

Use Newton's Method to find an approximation of 25^(1/3) correct to within 10^(-10).

```
NewtonsMethod();

fprintf('\nThe Bisection Method takes 31 iterations to approximate
 25^(1/3)\n');
fprintf('Newtons Method takes 9 iterations to approximate
 25^(1/3)\n');
fprintf('Newtons method approximates 25^(1/3) %.f%% faster than the
 Bisection method\n\n', 100*(31-9)/31);
```

```
n: 9 p9: 2.9240177382 |error|: 0.0000000001
```

```
The Bisection Method takes 31 iterations to approximate 25^(1/3)
Newtons Method takes 9 iterations to approximate 25^(1/3)
Newtons method approximates 25^(1/3) 71% faster than the Bisection
 method
```

Problem 3

Use Newton's method to find the time, accurate to within 10^(-5) s that it takes for an object falling from 300 ft to hit the ground.

```
t = FallingObject();

fprintf('\nThe object takes %.5f seconds to hit the ground\n', t);
```

```
n: 5 t5:  6.00373 |error|: 0.00001

The object takes 6.00373 seconds to hit the ground
```

Problem 4

Use Newton's method to calculate how much of a drug should be administered to a patient given the maximum safe concentration and equation for concentration of drug in the bloodstream, how long it takes to reach that concentration, and when to administer a second dose.

```
[hours, minutes] = MaxDrugConcentration();

fprintf('\n%f units of medicine should be injected to reach\n',
 exp(1)/3);
fprintf('the max safe concentration after %d hours.\n', 3);
fprintf('The second injection should be injected\n');
fprintf('%d hours and %d minutes later.\n', hours, minutes);
```

```
n: 4 t4:  11.07790 |error|: 0.00001

0.906094 units of medicine should be injected to reach
the max safe concentration after 3 hours.
The second injection should be injected
11 hours and 5 minutes later.
```

Problem 5

Use Newton's method to approximate the zero of the function f(x) = x^2 - 2xe^(-x) + e^(-2x) to within 10^(-8)

```
x = NewtonsMethod2();
fprintf('\nx = %.8f\n', x);
```

```
n: 13 p13:  0.56714329 |error|: 0.00000001

x = 0.56714329
```

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