CS 3500 AA – Numerical Methods I
Fall 2015
Homework Problem Set #8
Due: 11/05/2015

Be sure to do all your work on separate paper, and include all steps where appropriate. All homework must follow the formatting rules posted on Blackboard.

1. Let $f(x) = e^{-x}\ln(x+2)$. Complete the following table using the two-point backward difference approximation of $f'(2)$.

h_n	Approximation	Absolute Error
0.1		
0.05		
0.025		

2. Let $f(x) = 2\sin(x) - \sqrt{2x+3}$. Complete the following table using the three-point central difference approximation of $f'(0)$. Be sure to perform evaluations in radians.

h_n	Approximation	Absolute Error
0.1		
0.05		
0.025		

3. Estimate the rate of change of the sound of speed, a (in meters per second), with respect to temperature, T (in degree Celsius), at $T = 20$, $T = 40$, and $T = 60$ using the two-point backward difference approximations.

T	0	10	20	30	40	50	60	70	80	90	100
a	1402	1447	1482	1509	1529	1542	1511	1553	1554	1550	1543

4. A jet fighter's position on an aircraft carrier's runway was recorded during landing. The data is given below.

t (seconds)	0	0.52	1.04	1.56	2.08	2.60
s (meters)	153	185	208	249	261	271

Use appropriate $O(h^4)$ methods to approximate the velocity and acceleration of the jet fighter at $t = 1.04$ and $t = 1.56$.

5. The following approximations of $f'(2)$ were obtained from a difference approximation of $O\left(h^2\right)$.

h	Approximation
0.05	4.15831
0.025	4.16361

Perform a extrapolation technique based on proportionality to obtain a better approximation of $f'(2)$.

6. The following approximations of $f'(-3)$ were obtained from a difference approximation of $O\left(h^4\right)$.

h	Approximation
0.01	−3.2213
0.005	−3.3245

Perform a extrapolation technique based on proportionality to obtain a better approximation of $f'(-3)$.