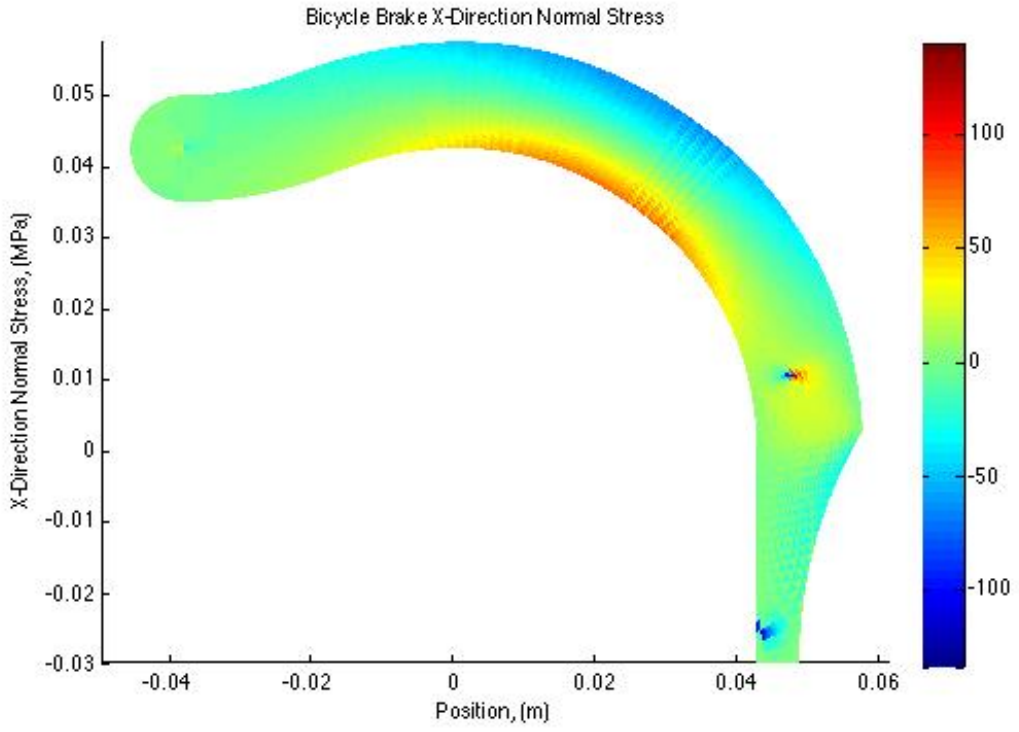
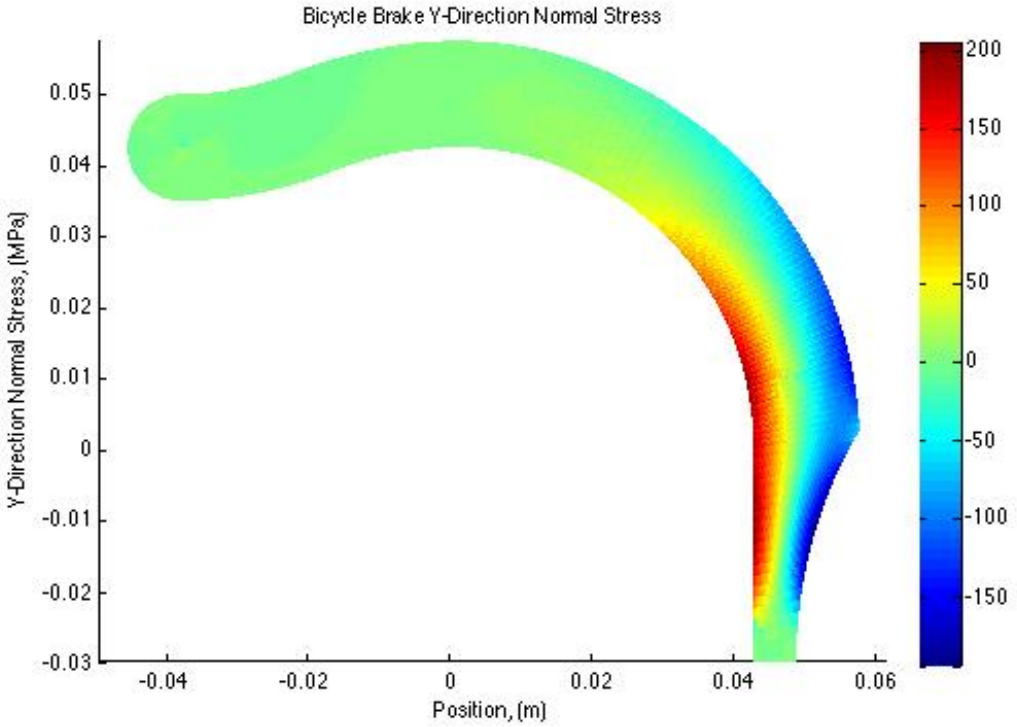
Andrew Mathews (atm63)
MAE 3250 – Section 201
Project 1 Report

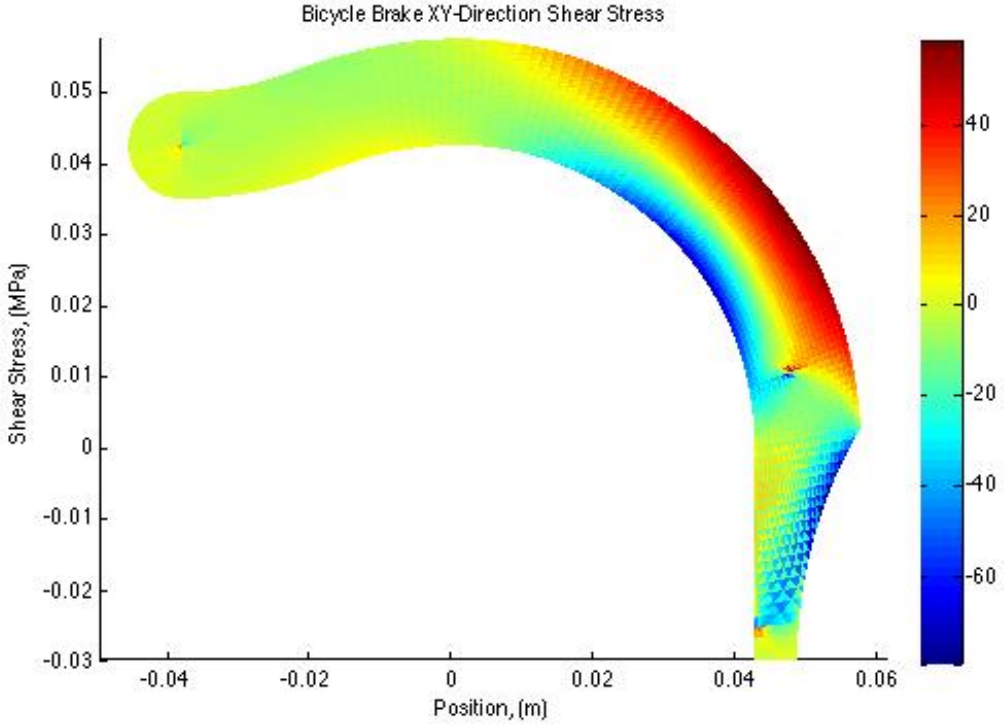
1. The theoretical and calculated values for stress and strain for the plate extension problem all were equal.

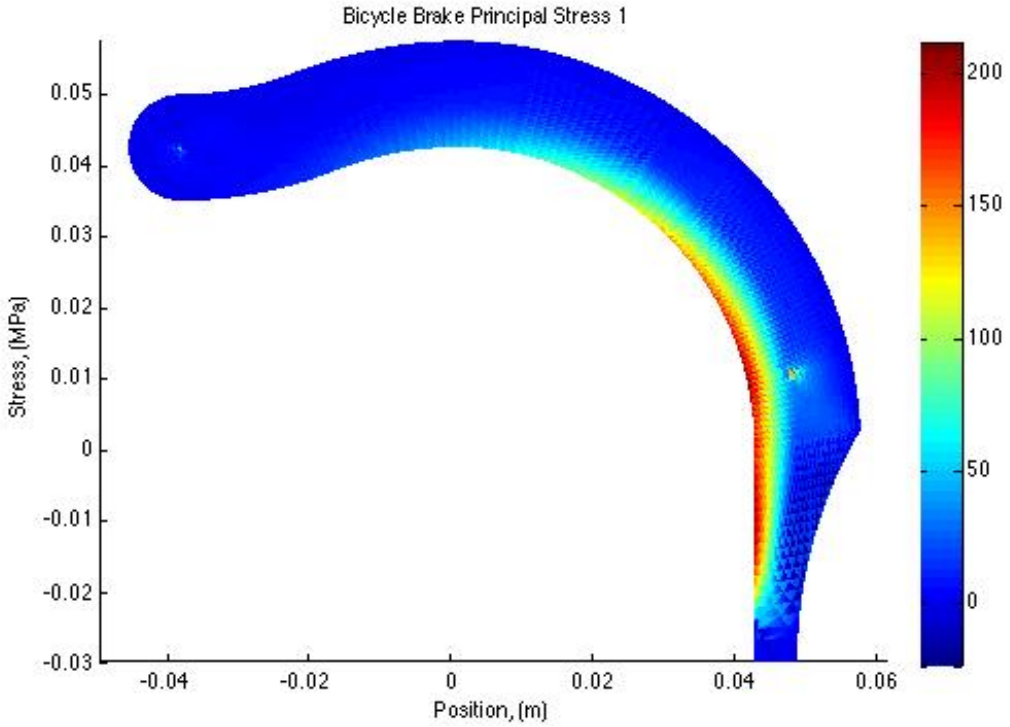
	σ_x	σ_y	τ_{xy}	ε_x	ε_y	γ_{xy}
Theoretical	14 MPa	0	0	200 με	-70 με	0
Calculated	14 MPa	0	0	200 με	70 με	0

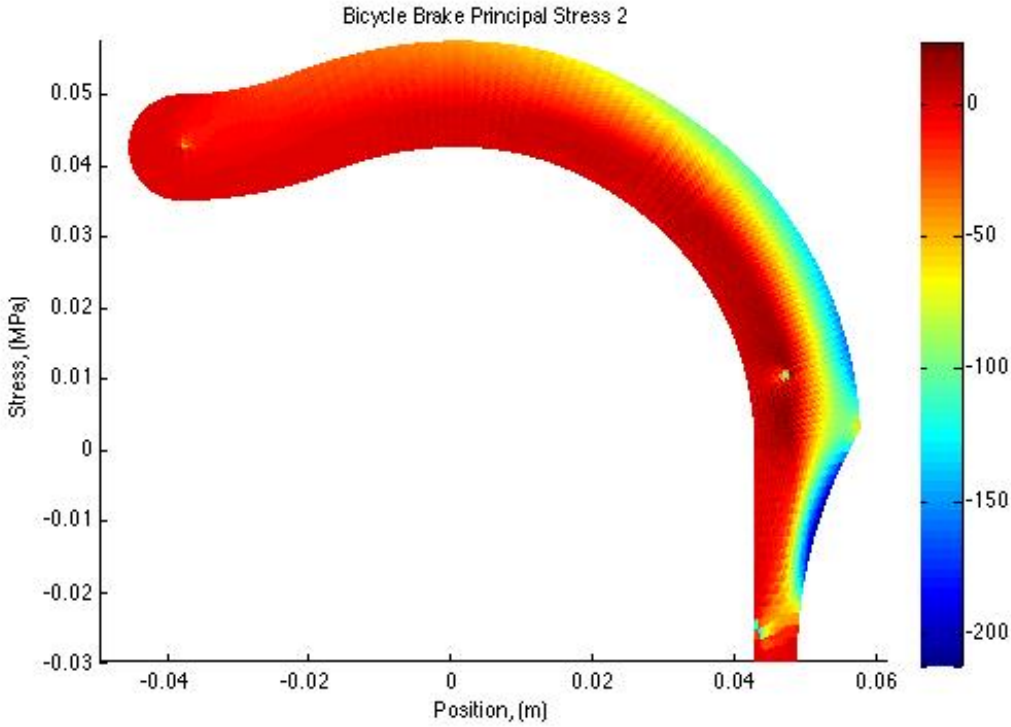
2. The stress profile for the analytical solution for the straight beam is similar to the stress profile for the radial stress for the caliper for the cross-section. The locations of the neutral axes do not differ. Meanwhile, the first principal stress approximates the longitudinal stress for negative values from the neutral axis while it approximates the radial stress for positive values. The opposite is true for the second principal stress. Both are true for the coarse and fine meshes.
3. The stress and strain calculations are not affected by the approximate locations of the modeling of the brake geometry; they are determined by the displacements at each node.

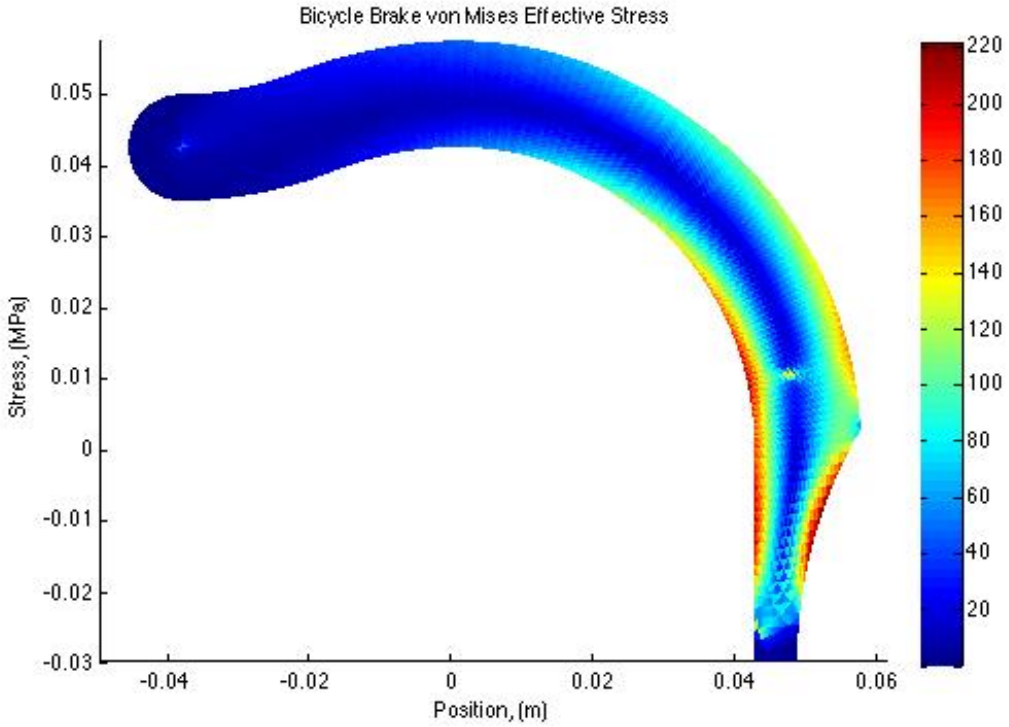


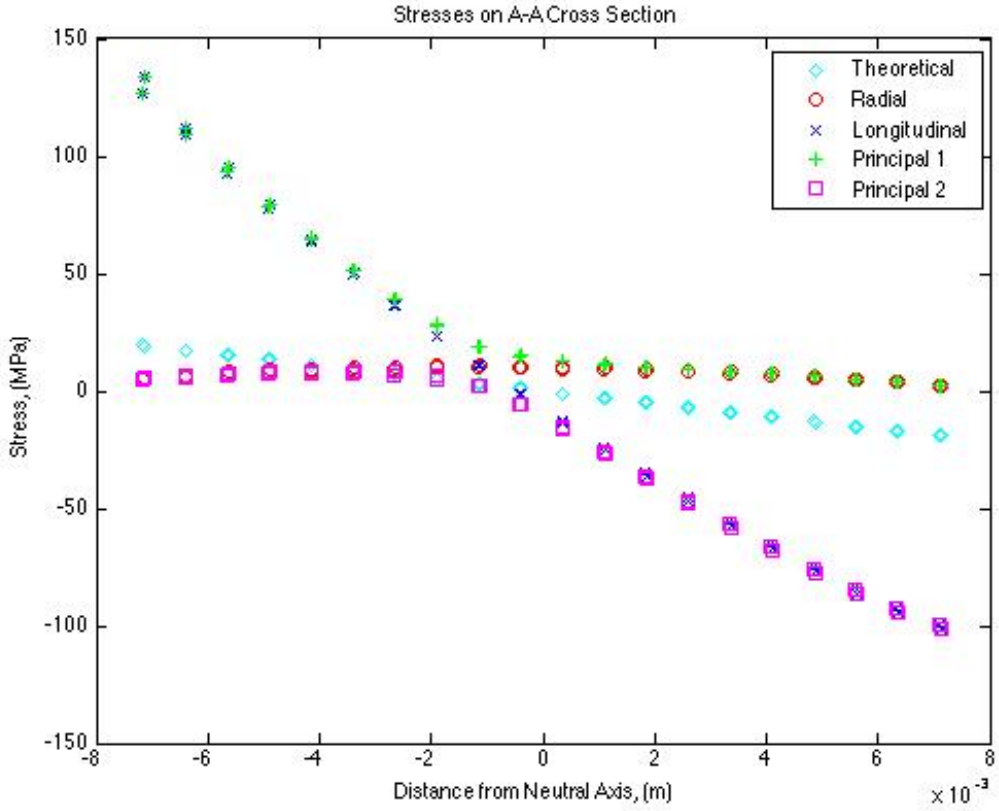

Bicycle Brake Y-Direction Normal Stress
Y-Direction Normal Stress, (MPa)
Position, (m)
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.02
0
0.02
0.04
0.06
200
150
100
50
0
-50
-100
-150


Bicycle Brake XY-Direction Shear Stress
Shear Stress, (MPa)
Position, (m)
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.02
0
0.02
0.04
0.06
40
20
0
-20
-40
-60


Bicycle Brake Principal Stress 1
Stress, (MPa)
Position, (m)
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.02
0
0.02
0.04
0.06
200
150
100
50
0


Bicycle Brake Principal Stress 2
Stress, (MPa)
Position, (m)
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.02
0
0.02
0.04
0.06
0
-50
-100
-150
-200


Bicycle Brake von Mises Effective Stress
Stress, (MPa)
Position, (m)
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.02
0
0.02
0.04
0.06
220
200
180
160
140
120
100
80
60
40
20


Stresses on A-A Cross Section
Stress, (MPa)
Distance from Neutral Axis, (m)
x 10^-3
Theoretical
Radial
Longitudinal
Principal 1
Principal 2
150
100
50
0
-50
-100
-150
-8
-6
-4
-2
0
2
4
6
8