Q2b

```
theta = [0:1:90];

LU = 5.56 %* 10^6;
```

```
LU = 5.5600
```

```
TU = 3.10 %* 10^6;
```

```
TU = 3.1000
```

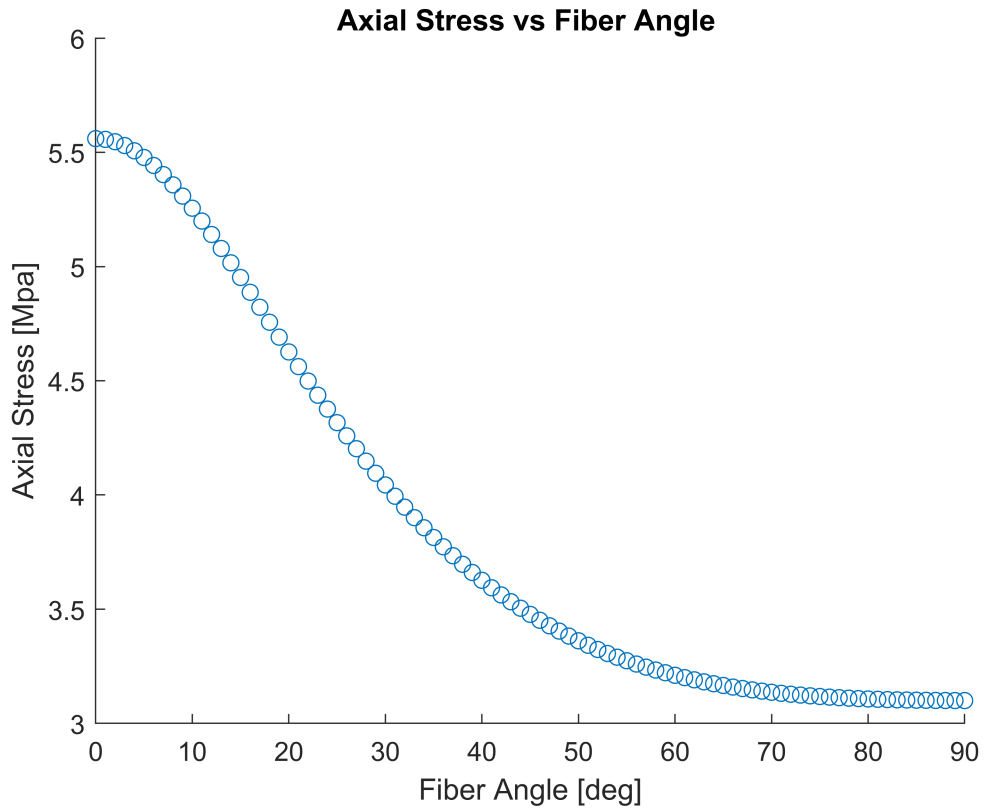
```
LTU = 2.10 % 10^6;
```

```
LTU = 2.1000
```

```
stress = 1 ./ sqrt(( (cosd(theta).^4) ./ (LU)^2) - ( ((cosd(theta).^2).*sind(theta).^2) ./ (LU
```

```
stress = 1×91
    5.5600    5.5566    5.5465    5.5298    5.5067    5.4775    5.4426    5.4025 ···
```

```
figure
hold on
xlabel('Fiber Angle [deg]')
ylabel( 'Axial Stress [Mpa]')
title( 'Axial Stress vs Fiber Angle ')
scatter(theta, stress)
```




```
% AS fiber alignment with the axial direction approaches 90 degrees, the
% fibers become less aligned with the axial direction.
% Thus, the maximum axial stress decreases exponentially, meaning that it will
% require less stress to rupture
```

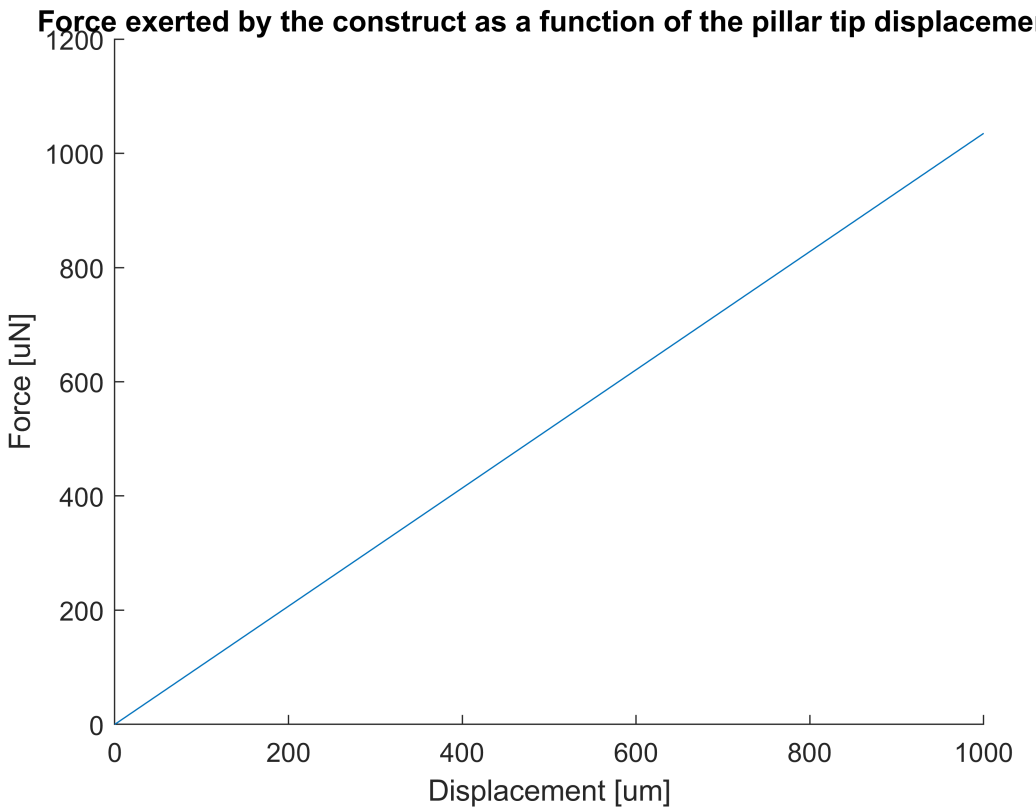
3b

```
displacement = [0:1:1000]; %micro
% was F=0.57x but there are two beams so mult by two
Force = 1.035 *displacement %uN
```

```
Force = 1×1001
10^3 ×
         0    0.0010    0.0021    0.0031    0.0041    0.0052    0.0062    0.0072 ···
```

```
figure
```

```
hold on
xlabel('Displacement [um]')
ylabel( 'Force [uN]')
title( 'Force exerted by the construct as a function of the pillar tip displacement')
plot(displacement, Force)
```




```
% These force magnitudes are reasonable. According to the Vandenburgh 2008 paper, the
% forces exerted on the cells ranged from 0 - 1000 uN which is similiar to
% the graph above
```

4

```
Sections = [4,11,15,19,25,30,40]
```

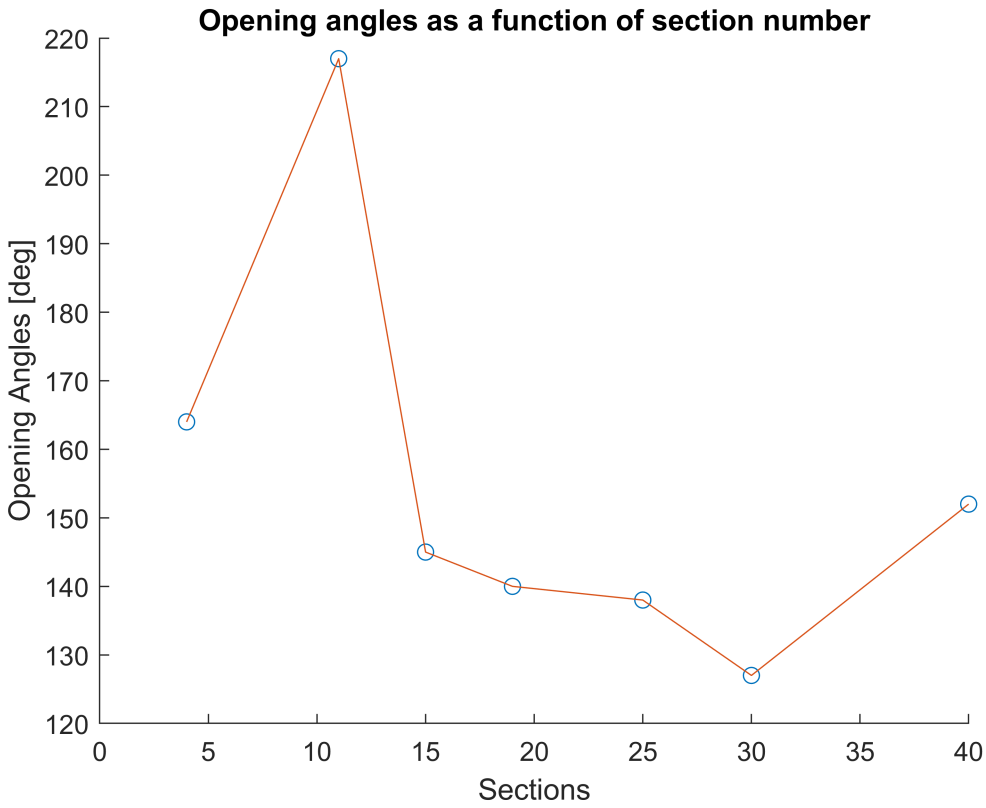
```
Sections = 1×7
     4    11    15    19    25    30    40
```

```
OpenAngles = [164, 217, 145,140,138,127,152] %Determined using ImageJ
```

```
OpenAngles = 1×7
   164   217   145   140   138   127   152
```

```
figure
hold on
xlabel('Sections')
ylabel( 'Opening Angles [deg]')
title( 'Opening angles as a function of section number')
scatter(Sections, OpenAngles)
```

```
plot(Sections, OpenAngles)
```



4b

```
% Yes, the data on humans above supports the hypothesis that an overall, larger size
%  animal will have bigger opening angles. The Pig had an average opening
%  angle of 70 degrees, while the Rat had an average opening angle of about
%  25 degrees. For humans, the averafe seems to be roughly 145 degrees.
```

5

```
a. 6
b. 5 hours
c. Yes
```