**I Don’t Wanna Be Chicken Worksheet Answer Key**

**Fracture Data Analysis of 3-Point Bending on a Chicken Bone**

1. Look at the data table and find the Young’s Modulus given for your data set keeping in mind the average age of a chicken at slaughter is 6 weeks.   
   Six-week old chicken YM = A: 377,000,000 Pa; B: 434,000,000 Pa; C: 363,000,000 Pa  
   How does this value compare to the Young’s Modulus of a two-month old female mouse from the following scholarly article: Two-month old mouse YM = 7,400,000,000 Pa  
   <http://www.musculoskeletalcore.wustl.edu/mm/files/Understanding%203pt%20Bending%20outcomes.pdf> Does this make sense? Explain why or why not?   
   The data shows that the mouse has stiffer bones than the chicken. One reason could be that the mouse as a species has stiffer bones. Another might be that the average lifespan of a mouse is less than two years in the wild whereas a backyard chicken might live for six to eight years. The chicken at six weeks is still immature.
2. How does the Young’s Modulus in this activity compare with the Young’s Modulus of a 20-month old female mouse from the article referenced in the previous question?   
   Twenty-month old mouse YM = 5,600,000,000 Pa  
   Note that in the wild, mice tend to live only five or six months; however, in ideal indoor conditions they can live up to two years. Does this make sense? Explain.  
   A twenty-month mouse would be considered old. Hence, its bone stiffness has softened over time. It is interesting to note that it is still stronger than the juvenile chicken from the previous question.
3. Use Desmos to run a higher-order polynomial regression on the second data set representing the ductile region. You will have to experiment with regression functions to determine if the function is best modeled by a quadratic, cubic, or quartic. Notice the R2 value; however, if the value does not change much, there is no point in adding complexity using a higher-ordered function. Which model did you choose?  
   A: quadratic; B: cubic; C: cubic
4. Write the deformation region’s best-fit polynomial along with the restricted domain, using interval notation. Note: Since the domain starts with where you left off the linear restriction, one should be closed and the other open in the interval notation. (You may have to use closed notation in Desmos in order for the graph to show.)  
   A: B:   
   C:
5. Write a complete piece-wise defined function for the entire data set:  
     
   A:  
     
   B:  
     
   C:

linear

ductile

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sample A** | | **Sample B** | | **Sample C** | |
| **Displacement (m)** | **Force (N)** | **Displacement (m)** | **Force (N)** | **Displacement (m)** | **Force (N)** |
| 0 | 0 | 0 | 0 | 0 | 0 |
| .00025 | 5 | .00025 | 5 | .00025 | 5 |
| .0005 | 10 | .0005 | 20 | .0005 | 20 |
| .00075 | 40 | .00075 | 70 | .00075 | 70 |
| .001 | 75 | .001 | 85 | .001 | 120 |
| .0012 | 110 | .0012 | 145 | .0012 | 160 |
| `.0015 | 150 | .0015 | 200 | .0015 | 180 |
| .00175 | 185 | .00175 **YIELD** | 240 | .00175 | 220 |
| .0020 | 220 | .0020 | 265 | .0020 **YIELD** | 240 |
| .00225 | 245 | .00225 | 310 | .00225 | 235 |
| .0025 | 275 | .0025 | 330 | .0025 | 237 |
| .00275 **YIELD** | 295 | .00275 | 350 | .00275 | 245 |
| .003 | 310 | .003 | 360 | .003 | 252 |
| .00325 | 320 | .00325 | 365 | .00325 | 244 |
| .0035 | 330 | .0035 | 370 | .0035 | 237 |
| .00375 | 325 | .00375 | 362 | .00375 | 233 |
| .004 | 315 | .004 | 360 | .004 | 232 |
| .00425 | 300 | .00425 | 355 | .00425 | 231 |
| .0045 **FRACTURE** | 280 | .0045 **FRACTURE** | 350 | .0045 **FRACTURE** | 227 |
| **Young’s Modulus** | | **Young’s Modulus** | | **Young’s Modulus** | |
| 3.77E+08 N/m2 | | 4.34E+08 N/m2 | | 3.63+08 N/m2 | |

|  |  |
| --- | --- |
| **Specimen A** | |
| **Displacement (m)** | **Force (N)** |
| 0 | 0 |
| .00025 | 5 |
| .0005 | 10 |
| .00075 | 40 |
| .001 | 75 |
| .0012 | 110 |
| .0015 | 150 |
| .00175 | 185 |
| .0020 | 220 |
| .00225 | 245 |
| .0025 | 275 |
| .00275 | 295 |
| .003 | 310 |
| .00325 | 320 |
| .0035 | 330 |
| .00375 | 325 |
| .004 | 315 |
| .00425 | 300 |
| .0045 | 280 |
| **Young’s Modulus** | |
| 3.77E+08 N/m2 | |

|  |  |
| --- | --- |
| **Specimen B** | |
| **Displacement (m)** | **Force (N)** |
| 0 | 0 |
| .00025 | 5 |
| .0005 | 20 |
| .00075 | 70 |
| .001 | 85 |
| .0012 | 145 |
| .0015 | 200 |
| .00175 | 240 |
| .0020 | 265 |
| .00225 | 310 |
| .0025 | 330 |
| .00275 | 350 |
| .003 | 360 |
| .00325 | 365 |
| .0035 | 370 |
| .00375 | 362 |
| .004 | 360 |
| .00425 | 355 |
| .0045 | 350 |
| **Young’s Modulus** | |
| 4.34E+08 N/m2 | |

|  |  |
| --- | --- |
| **Specimen C** | |
| **Displacement (m)** | **Force (N)** |
| 0 | 0 |
| .00025 | 5 |
| .0005 | 20 |
| .00075 | 70 |
| .001 | 120 |
| .0012 | 160 |
| .0015 | 180 |
| .00175 | 220 |
| .0020 | 240 |
| .00225 | 235 |
| .0025 | 237 |
| .00275 | 245 |
| .003 | 252 |
| .00325 | 244 |
| .0035 | 237 |
| .00375 | 233 |
| .004 | 232 |
| .00425 | 231 |
| .0045 | 227 |
| **Young’s Modulus** | |
| 3.63+08 N/m2 | |