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Lab 04b

Planning Code

1. Estimate the curve by a series of four linear segments and calculate Young's Modulus value: Point O (0, 0) to Point A (0.01, 42) to Point B (ignored because the model is idealized) to Point C (0.06, 44) to Point D (0.18, 60) to Point E (0.26, 50). Young's Modulus = stress / strain. This value from Point O to A is 4200, B to C is 40, C to D is 133.33, and D to E is -125.
2. Variables:

```
pointO = [(0, 0)]
pointA = [(0.01, 42)]
pointC = [(0.06, 44)]
pointD = [(0.18, 60)]
pointE = [(0.26, 50)]
# to display data given

YM1 = 4200
YM2 = 40
YM3 = 133.3333
YM4 = -125
# calculated the value of Young's Modulus for each line segment using the change in stress/change in strain

y1 = 0 + YM1 * (strain - 0)
y2 = 42 + YM2 * (strain - 0.01)
y3 = 44 + YM3 * (strain - 0.06)
y4 = 60 + YM4 * (strain - 0.18)
strain = float(input("Enter strain: ")
# request user input
```

3. Plan:

```
y1 = 0 + YM1 * (strain - 0)
y2 = 42 + YM2 * (strain - 0.01)
y3 = 44 + YM3 * (strain - 0.06)
y4 = 60 + YM4 * (strain - 0.18)
# plug in user input

if 0 <= strain < 0.01:
        print("Increasing linear elastic region at", y1, "ksi")
elif 0.01 <= strain < 0.06:
        print("Plastic region at", y2, "ksi")
```

```
elif 0.06 <= strain < 0.18:
        print("Strain hardening region at", y3, "ksi")
elif 0.18 <= strain <= 0.26:
        print("Necking region at", y4, "ksi")
else:
        print("The stress level is not indicated.")
# loop the strain given to find proper category, then calculated to find stress in ksi
```

4. Test:

- Input: 0.005 // Output: Increasing linear elastic region at 21.0 ksi
- This is a typical test case right in between Points O and A. This input is testing the equation as well as the conditional statement that distributes the output to a specific region along the curve.
- Input: 0.01 // Output: Plastic region at 42.0 ksi
- This is an edge test case on the transition of Point A going to Point C. This input is testing the equation as well as the conditional statement that distributes the output to a specific region along the curve.
- Input: 0.12 // Output: Strain hardening region at 51.99 ksi
- This is a typical test case right in between Points C and D. This input is testing the equation as well as the conditional statement that distributes the output to a specific region along the curve.
- Input: 0.18 // Output: Necking region at 60.0 ksi
- This is an edge test case on the transition of Point D going to Point E. This input is testing the equation as well as the conditional statement that distributes the output to a specific region along the curve.
- Input: 0.30 // Output: The stress level is not indicated.
- This test case is verifying that the program outputs an answer that is outside of the graph given. In this scenario, the available strain inputs vary from 0.0 to 0.26, so anything outside that range will print the "else" portion of the conditional. This test case confirms the overall function of my code.