Assignment: Module 10 Name: Hoyoung kim

Disclaimer: This is my work, not that of others

Total Score: 40

1. 10
2. 10
3. 10

4. 10

1. (10 pt) Use least-squares regression to fit a straight line to the data below.  
x 0 2 4 6 9 11 12 15 17 19  
y 5 6 7 6 9 8 8 10 12 12  
Along with the slope and intercept, compute the coefficient of determination, 𝑅2.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| x | y | x\*y | x\*x |  |  |  |  |  | y true | yi-yper | yi-yper^2 |
| 0 | 5 | 0 | 0 | -9.5 | -3.3 | 90.25 | 10.89 | 31.35 | 4.8881175 | 0.11188251 | 0.012517696 |
| 2 | 6 | 12 | 4 | -7.5 | -2.3 | 56.25 | 5.29 | 17.25 | 5.6064085 | 0.393591455 | 0.154914234 |
| 4 | 7 | 28 | 16 | -5.5 | -1.3 | 30.25 | 1.69 | 7.15 | 6.3246996 | 0.675300401 | 0.456030631 |
| 6 | 6 | 36 | 36 | -3.5 | -2.3 | 12.25 | 5.29 | 8.05 | 7.0429907 | -1.042990654 | 1.087829505 |
| 9 | 9 | 81 | 81 | -0.5 | 0.7 | 0.25 | 0.49 | -0.35 | 8.1204272 | 0.879572764 | 0.773648247 |
| 11 | 8 | 88 | 121 | 1.5 | -0.3 | 2.25 | 0.09 | -0.45 | 8.8387183 | -0.838718291 | 0.703448372 |
| 12 | 8 | 96 | 144 | 2.5 | -0.3 | 6.25 | 0.09 | -0.75 | 9.1978638 | -1.197863818 | 1.434877727 |
| 15 | 10 | 150 | 225 | 5.5 | 1.7 | 30.25 | 2.89 | 9.35 | 10.2753 | -0.275300401 | 0.075790311 |
| 17 | 12 | 204 | 289 | 7.5 | 3.7 | 56.25 | 13.69 | 27.75 | 10.993591 | 1.006408545 | 1.012858159 |
| 19 | 12 | 228 | 361 | 9.5 | 3.7 | 90.25 | 13.69 | 35.15 | 11.711883 | 0.28811749 | 0.083011688 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| 95 | 83 | 923 | 1277 |  |  | 374.5 | 54.1 | 134.5 |  | SSe | 5.794926569 |
| 9.5 | 8.3 |  |  |  |  |  | SSt |  |  |  |  |
| 10 | 95 |  |  | a0 | 0.359145527 | | slope |  |  |  |  |
| 95 | 1277 |  |  | a1 | 4.88811749 | | y-int |  |  |  |  |
| y= 4.888+0.359x | | |  | R2 | 0.892884906 | |  |  |  |  |  |

Per spread sheet, slope is 0.359, y intercept is 4.888 and regression is 0.892

2. (10 pt) On average the surface area, A, of a human is related to weight, W, and height,  
H. Measurements for several individuals of height 180 cm and different weights (kg),  
give values of area (𝑚2) in the following table.  
W (kg) 70 75 77 80 82 84 87 90  
A (𝐦𝟐) 2.10 2.12 2.15 2.20 2.22 2.23 2.26 2.30  
Show that a power law, 𝐴 = 𝑎𝑊𝑏, fits these data reasonably well. Present plots of  
data along with the model line. Predict what the surface area is for a 95-kg person.

Using python I was able to find the log of all the values then using polyfit I was able

to fine the linearized model. Then using power law, I was able to find that the person

with 95 kg would have surface area of about 2.3404080703850525m^2

3. (10 pt) Fit an exponential model to  
x 0.4 0.8 1.2 1.6 2 2.3  
y 800 985 1490 1950 2850 3600

Using python I was able to find the log of both values, then using vstack and

Transpose as shown on the slides, I was able to find that exponential model to

the given table is 549.815e^0.8127x

1. (10 pt) Find a 3rd order polynomial to fit the following data. Plot the data with your  
   model curve. Tabulate the residual of the predict y-value.  
   x 3 4 5 7 8 9 11 12  
   y 1.6 3.6 4.4 3.4 2.2 2.8 3.8 4.6

Using Python polyfit, I was able to find that the regression model is

0.046675x^3-1.04120692x^2+7.14381722x-11.48870718=f(x)

Using this, I was able to plot