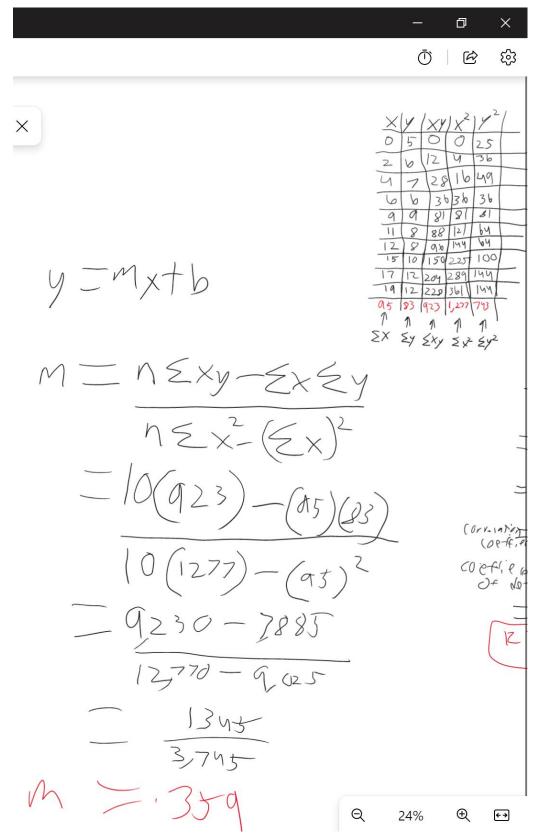Assignment: Homework Ten   Name: Cody Strange
Disclaimer: This is my work, not that of others
Total Score: 40 (in points, not percentage)

Problem 1 score: 10
Problem 2 score: 10
Problem 3 score: 10
Problem 4 score: 10

y	xy	x²	y²
5	0	0	25
6	12	4	36
7	28	16	49
6	6	36	36
9	9	81	81
11	8	88	121	64
12	8	96	144	64
15	10	150	225	100
17	12	204	289	144
19	12	228	361	144
95	83	923	1,277	743

↑ ↑ ↑ ↑ ↑
ΣX Σy Σxy Σx^2 Σy^2

$$r = \frac{n\Sigma xy - \Sigma x \Sigma y}{\sqrt{[n\Sigma x^2 - (\Sigma x)^2][n\Sigma y^2 - (\Sigma y)^2]}}$$

$$= \frac{10(923) - (95 \cdot 83)}{\sqrt{[10(1,277) - (95)^2][10(743) - (83)^2]}}$$

$$= \frac{9,230 - 7,885}{\sqrt{(12,770 - 9,025)(7430 - 6,889)}}$$

$$= \frac{1,345}{\sqrt{(3745)(541)}}$$

$$= \frac{1,345}{\sqrt{2,026,045}}$$

$$= \frac{1,345}{1423.3}$$

Correlation = 0.94
coefficient

coefficient
of determination = $(0.94)^2$

$= 0.89$

$\boxed{R = 89\%}$

1.
R = 89%

X	Y	XY	X^2	Y^2
0	5	0	0	25
2	6	12	4	36
4	7	28	16	49
6	6	36	36	36
9	9	81	81	81
11	8	88	121	64
12	8	96	144	64
15	10	150	225	100
17	12	204	289	144
19	12	228	361	144
95	83	923	1,277	743
↑	↑	↑	↑	↑
Σx	Σy	Σxy	Σx^2	Σy^2

$$y = mx + b$$

$$m = \frac{n\Sigma xy - \Sigma x \Sigma y}{n\Sigma x^2 - (\Sigma x)^2}$$

$$= \frac{10(923) - (95)(83)}{10(1277) - (95)^2}$$

$$= \frac{9230 - 7885}{12770 - 9,025}$$

$$= \frac{1345}{3,745}$$

$$m = .359$$

Correlation coefficient

coefficient of no[...]

R

Slope: .359

$$b = \frac{\Sigma y - m \Sigma x}{n}$$

$$= \frac{83 - 0.359\,(95)}{10}$$

$$= \frac{83 - 34.105}{10}$$

$$= \frac{48.895}{10}$$

$$b = 4.888$$

Y-Intercept: 4.888

2.

```
1    import numpy as np
2    import math
3    W = np.log(np.array([70, 75, 77, 80, 82, 84, 87, 90]))
4    A = np.log(np.array([2.1, 2.12, 2.15, 2.2, 2.22, 2.23, 2.26, 2.3]))
5    lFit = np.polyfit(W, A, 1)
6    a=math.exp(lFit[1])
7    b=lFit[0]
8    A95 = a*math.pow(95,b)
9    print(f"a={a}, b={b}, A95={A95}")
```

```
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL

● PS D:\School\CS3320\HW\HW-10> & C:/Users/cody1/AppData/Local/Progr
a=0.4148889255182936, b=0.37991140040248494, A95=2.340408070385052
○ PS D:\School\CS3320\HW\HW-10>
```

3.

```
question_three.py > ...
1    import numpy as np
2    import math
3    y = np.log(np.array([800, 985, 1490, 1950,2850, 3600]))
4    RHS=np.matmul(np.vstack((np.array([0.4, 0.8, 1.2, 1.6, 2, 2.3]), np.power(np.array([0.4, 0.8, 1.2, 1.6, 2, 2.3]),0))).transpose().transpose(),y)
5    lFit =np.matmul(np.linalg.inv(np.matmul(np.vstack((np.array([0.4, 0.8, 1.2, 1.6, 2, 2.3]), np.power(np.array([0.4, 0.8, 1.2, 1.6, 2, 2.3]),0))).transpose().transpose(),np.vstack((np.array([0.4,
6    a=math.exp(lFit[1])
7    b=lFit[0]
8    y2 = a*math.exp(b*2)
9    print(f"a={a}, b={b}, y(2){y2}")
10
11
```

```
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL

● PS D:\School\CS3320\HW\HW-10> & C:/Users/cody1/AppData/Local/Progra
a=549.8153040029594, b=0.8127275122277112, y(2)=2793.46331175816
○ PS D:\School\CS3320\HW\HW-10>
```

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		x	y	x^2	x^3	x^4	x^5	x^6	xy	x^2*y	x^3*y		yModel	yDiff
2		3	1.6	9	27	81	243	729	4.8	14.4	43.2		1.83213464	-0.2321346
3		4	3.6	16	64	256	1024	4096	14.4	57.6	230.4		3.41451602	0.18548398
4		5	4.4	25	125	625	3125	15625	22	110	550		4.03470796	0.36529204
5		7	3.4	49	343	2401	16807	117649	23.8	166.6	1166.2		3.5087479	-0.1087479
6		8	2.2	64	512	4096	32768	262144	17.6	140.8	1126.4		2.92270809	-0.7227081
7		9	2.8	81	729	6561	59049	531441	25.2	226.8	2041.2		2.49470324	0.30529676
8		11	3.8	121	1331	14641	161051	1771561	41.8	459.8	5057.8		3.23302278	0.56697722
9		12	4.6	144	1728	20736	248832	2985984	55.2	662.4	7948.8		4.95945937	-0.3594594
10														
11	sum	59	26.4	509	4859	49397	522899	5689229	204.8	1838.4	18164			
12														
13	A	8	59	509	4859	b		26.4	Model -11.48871					
14		59	509	4859	49397			204.8	7.1438172					
15		509	4859	49397	522899			1838.4	-1.041207					
16		4859	49397	522899	5679229			18164	0.046676					

4.

Regression Model: y = 0.04688x^3-1.0412x^2+7.1438x-11.4887