Name: Amirtha Ganesh Pugazhendhi

Stages of the Program:

1) Inserted the Header files and libraries required like “math.h”, “stdio.h” , etc.,
2) In the main function, at first declared and initialized 2 arrays to hold the mass and max speed values.
3) Determined the array size of bodymass (max.speed) using sizeof operator.
4) Declared and initialized the elements of inverse matrix (M^{-1}) and vector (b) to zero.
5) Used the flow control statement– “For loop” to calculate the values of matrix elements simultaneously and synchronously.
6) Plugged in the matrix and vector elements in the following expression to calculate co-efficient and exponent.

$$c = e^{(m22*b1)+(-m12*b2))/((m11*m22)-(m12*m21)}$$

$$a=((-m21*b1)+(m11*b2))/((m11*m22)-(m12*m21))$$

7) Designed user output for the program that includes 1) Assigment details 2) Topic of the program 3) Data table 4) Co-efficient and exponents 5) Physical relationship in a form of an equation.

Name: Amirtha Ganesh Pugazhendhi

Proof of program validity :

A known curve for power law validation was considered . The Equation considered is a simple known parabola.

$$Y = C\ x^a \text{ where } \mathbf{C = 1} \text{ and } \mathbf{a = 2}$$

This would yield the following values for X (MaxSpeed) and Y (Body mass)

```
// Validation case for a simple known parabola y = 1 * x ^ 2:
double mass[] = { 1,2,3,4,5,6,7,8,9,10 }; // X
double maxSpeed[]={ 1,4,9,16,25,36,49,64,81,100}; // Y
```

To Prove : The program is valid, if the coefficient is 1 and exponent is 2 this given known parabolic data set.

```
|---------------------------------------------|
| Body Mass[kg]        |   max.speed[km/h]    |
|---------------------------------------------|
|       1.000000       |       1.000000       |
|       2.000000       |       4.000000       |
|       3.000000       |       9.000000       |
|       4.000000       |       16.000000      |
|       5.000000       |       25.000000      |
|       6.000000       |       36.000000      |
|       7.000000       |       49.000000      |
|       8.000000       |       64.000000      |
|       9.000000       |       81.000000      |
|       10.000000      |       100.000000     |
|---------------------------------------------|

The power law exponent is 2.000 and the coefficient is 1.000

The physical relationship between the Bodymass and Max.speed is given the equation:

BodyMass = 1.000 * Max.Speed ^  2.000
```

output

Result: Since, resulting output coefficient is 1 and exponent is 2 , This proves that program is valid

Name: Amirtha Ganesh Pugazhendhi

Challenges faced:

1) Finding way to determine the length of the array was challenging.
2) Commands used for executing program that includes header file “math.h” in WSL command line was not explicitly known. Hence , it a lot time to debug the program why it was wrong. In General debugging was difficult and challenging.
3) In General Compiler & VS code setup was challenging due to the unfamiliarity.