

Performing Regressions Using desmos.com

This table shows how the air pressure in a car tire changes in the first 40 s after the tire is punctured.

- a) Perform a linear, quadratic and exponential regression
- b) Which model fits data best? Remember to look at the r-squared values.
- c) Use the model that you think best fits the data to predict the tire pressure:
 - i. After 12 s
 - ii. After 45 s

Time (s)	Tire pressure (kPa)
0	207
5	186
10	145
15	110
20	90
25	62
30	48
35	41
40	28

x_1	y_1
0	207
5	186
10	145
15	110
20	90
25	62
30	48
35	41
40	28

Instructions to perform regressions on demos

1. Go to www.desmos.com
2. Click the "+" sign and select table
3. Enter the data (you can copy and paste data as well)
4. Click the "+" sign and select f(x) expression
5. For linear regression enter $y_1 \sim mx_1 + b$
 For quadratic regression enter $y_1 \sim ax_1^2 + bx_1 + c$
 For exponential regression enter $y_1 \sim ab^x$

$y = mx + b$
 $y = -4.64333x + 194.756$

Linear regression

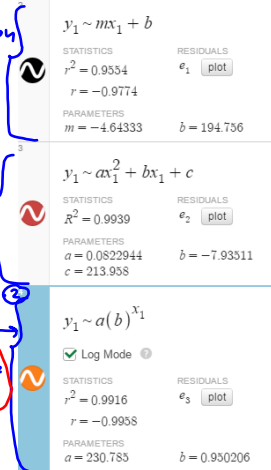
Tire Pressure = $-4.64333 \times \text{Time} + 194.756$

Quadratic regression

Tire Pressure = $0.0822944 \times (\text{Time})^2 - 7.93511 \times \text{Time} + 213.958$

Exponential regression

Tire Pressure = $230.785 \times (0.950206)^{\text{Time}}$



b) The quadratic model is the best model to fit this data since it has the highest r^2 -value ($r^2 \approx 0.9939$).

c)

i. Substitute $\text{Time} = 12$ into ②

$$\begin{aligned} \text{Tire Pressure} &= 0.0822944 \times (12)^2 - 7.93511 \times 12 + 213.958 \\ &\approx 130.59 \\ \therefore \text{The tire pressure after 12 s is approx. } &130.59 \text{ kPa} \end{aligned}$$

ii. Substitute $\text{Time} = 45$ into ②

$$\begin{aligned} \text{Tire Pressure} &= 0.0822944 \times (45)^2 - 7.93511 \times 45 + 213.958 \\ &\approx 23.5 \\ \therefore \text{The tire pressure after 45 s is approx. } &23.5 \text{ kPa.} \end{aligned}$$

Do example 2 on page 321.
also complete page 323: #1-8