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.

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

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

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 y1~mx1+b
   For quadratic regression enter $y1 \sim ax1^2+bx_1+c$
   For exponential regression enter $y1 \sim ab^x$

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

Linear regression

Tire Pressure $= -4.64333 \times$ Time $+ 194.756$

$y_1 \sim mx_1 + b$
STATISTICS $r^2 = 0.9554$, $r = -0.9774$; RESIDUALS e_1 plot
PARAMETERS $m = -4.64333$, $b = 194.756$

Quadratic regression

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

$y_1 \sim ax_1^2 + bx_1 + c$
STATISTICS $R^2 = 0.9939$; RESIDUALS e_2 plot
PARAMETERS $a = 0.0822944$, $b = -7.93511$, $c = 213.958$

Exponential regression →

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

$y_1 \sim a(b)^{x_1}$
Log Mode
STATISTICS $r^2 = 0.9916$, $r = -0.9958$; RESIDUALS e_3 plot
PARAMETERS $a = 230.785$, $b = 0.950206$

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

c)

i. Substitute Time $= 12$ into ②

Tire Pressure $= 0.0822944 \times (12)^2 - 7.93511 \times 12 + 213.958$
$\doteq 130.59$

∴ The tire pressure after 12 s is approx. 130.59 kPa

ii. Substitute Time $= 45$ into ②

Tire Pressure $= 0.0822944 \times (45)^2 - 7.93511 \times 45 + 213.958$
$\doteq 23.5$

∴ The tire pressure after 45 s is approx. 23.5 kPa.

Do example 2 on page 321.

also complete page 323: #1-8