Regression

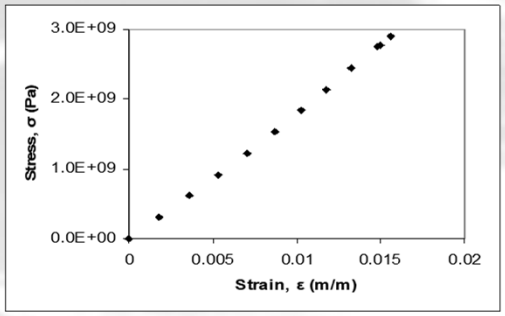
Reading While Skimming the Lines

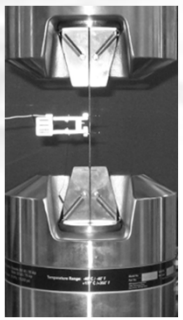
1

Applications

2

Stress vs Strain in a Composite Material

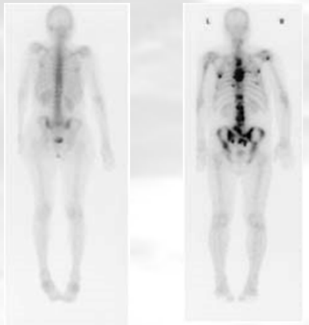




$$\sigma = E\varepsilon$$

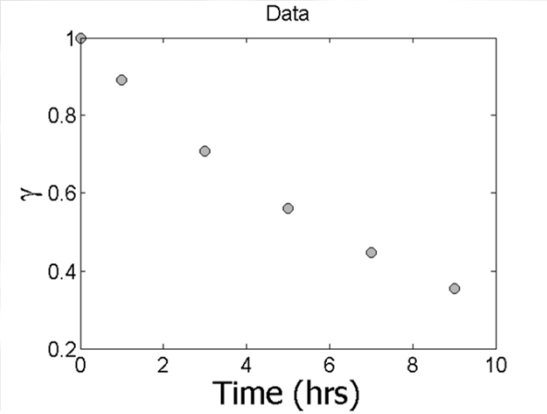
3

A Bone Scan



4

Radiation intensity from Technitium-99m



http://nm.mathforcollege.com

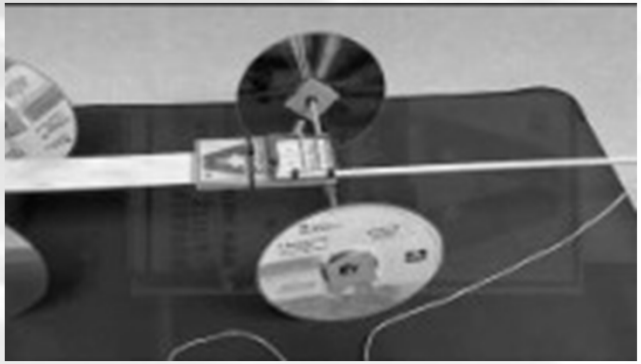
5

Mousetrap Car

http://nm.mathforcollege.com

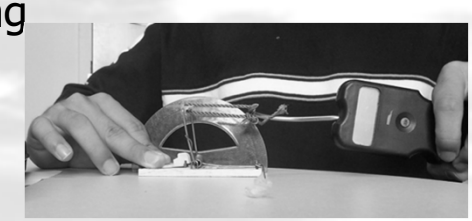
6

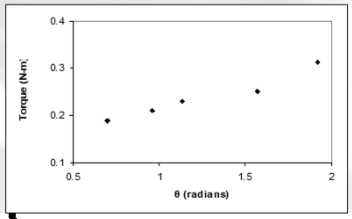
Mousetrap car demo



7

Torsional Stiffness of a Mousetrap Spring



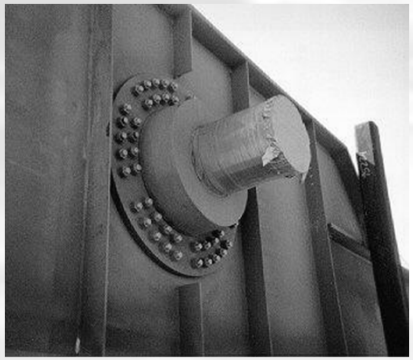


$$T = k_0 + k_1 \theta$$

http://nm.mathforcollege.com

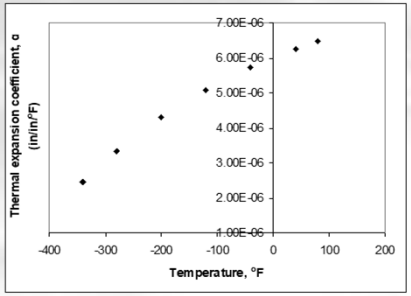
8

Trunnion-Hub Assembly



9

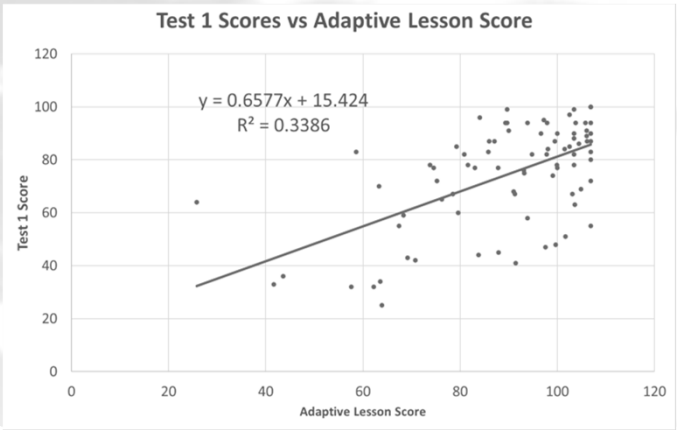
Thermal Expansion Coefficient Changes with Temperature?



$$\alpha = a_0 + a_1 T + a_2 T^2$$

10

Test 1 vs Online HW Score Fall 2021



11

THE END

12

06.01
Pre-Requisite Knowledge

http://nm.mathforcollege.com

13

Close to half the scores in a test given in a class are above the

- average score
- median score
- standard deviation
- mean score

Powered by Poll Everywhere

Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

15

The local minimum of a continuous function $f(x)$ occurs at $x = c$. The following is a sufficient condition for it to occur

- $f'(c) = 0,\ f''(c) < 0$
- $f'(c) > 0,\ f''(c) = 0$
- $f'(c) = 0,\ f''(c) > 0$
- $f'(c) = 0,\ f''(c) = 0$

Powered by Poll Everywhere

Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

16

The first derivative of ae^{bx} with respect to b, where a and x are constants is

- abe^{bx}
- 0
- xe^{bx}
- axe^{bx}

Powered by Poll Everywhere

Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

17

Given $(x_1, y_1), (x_2, y_2), \ldots\ldots\ldots\ldots (x_n, y_n)$, best fitting data to $y = f(x)$ by least squares requires minimization of

- $\sum_{i=1}^{n} [y_i - f(x_i)]$
- $\sum_{i=1}^{n} |y_i - f(x_i)|$
- $\sum_{i=1}^{n} [y_i - f(x_i)]^2$
- $\sum_{i=1}^{n} [y_i - \bar{y}]^2, \ \bar{y} = \frac{\sum_{i=1}^{n} y_i}{n}$

18

The first derivative of $\sum_{i=1}^{n} (y_i - ax_i)^2$ with respect to a is

- $\sum_{i=1}^{n} -2(y_i - ax_i)(x_i)$
- $\sum_{i=1}^{n} -2(y_i - ax_i)(-a)$
- $\sum_{i=1}^{n} 2(y_i - ax_i)$

19

The average of 7 numbers is given 12.6. If 6 of the numbers are 5,7,9,12,17 and 10, the remaining number is

- -47.9
- -47.4
- 15.6
- 28.2

20

Given $f(x, y) = 2x^2y + y^3 \sin(x)$, then $\frac{\partial f}{\partial x}$ is equal to

- $4xy + y^3 \cos(x)$
- $4x + 3y^2 \cos(x)$
- $2x^2 + 3y^2 \sin(x)$
- $2x^2y + 3y^2 \sin(x)$

21

For a function $f(x, y)$ of two variables, that is differentiable on an open set containing the point (x_0, y_0), the point (x_0, y_0) is a critical point of f if any of these conditions is met. Check the one that applies:

- $\frac{\partial f}{\partial x}(x_0, y_0) = 0$
- $\frac{\partial f}{\partial x}(x_0, y_0) = 0$ and $\frac{\partial f}{\partial y}(x_0, y_0) = 0$
- $\frac{\partial f}{\partial y}(x_0, y_0) = 0$

22

THE END

http://nm.mathforcollege.com

23

6.03
Linear Regression

http://nm.mathforcollege.com

24

For precise data pair measurements, regression is used to develop a curve that passes through each of the points.

- True
- False

26

Observed value of y

The following data

x	1	20	30	40
y	1	400	800	1300

is regressed with least squares regression to a straight line to give $y = -116 + 32.6x$. The **observed** value of y at $x = 20$ is

-136

400

536

Powered by Poll Everywhere

Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

27

Predicted value of y

The following data

x	1	20	30	40
y	1	400	800	1300

is regressed with least squares regression to a straight line to give $y = -116 + 32.6x$. The **predicted** value of y at $x = 20$ is

-136

400

536

Powered by Poll Everywhere

Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

28

Residual of y

The following data

x	1	20	30	40
y	1	400	800	1300

is regressed with least squares regression to a straight line to give $y = -116 + 32.6x$. The **residual** value of y at $x = 20$ is

-136

400

536

Powered by Poll Everywhere

Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

29

THE END

http://nm.mathforcollege.com

30