MRS21-Lesson -8 Mr. Pineda

Aim: How can we use technology to find a polynomial function to fit given data points in a contextual

Do Now: Find a polynomial function whose graph passes through each set of points: (− 4, 31), (2, 25), and (0, 3)

Do Now: Find a polynomial function whose graph passes through each set of points: (− 4, 31), (2, 25), and (0, 3)

Remember (x,y)

Hint: Use the calculator to try to find the best fit line. Use 3 different regressions: Linear, Quadratic and Cubic.

$y = x$ $y = x^2$ $y = x^3$

$(-4, 31)$, $(2, 25)$, and $(0, 3)$

List 1 (x)	List 2 (y)
−4	31
2	25
0	3

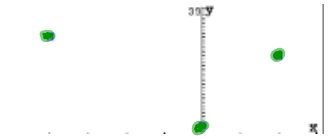
Degree=2

1 2

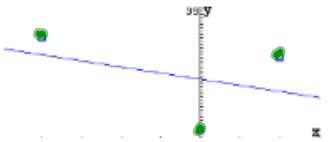
$25-31=-6$

$3-25=-22$

$-6-(-22)=16$



SCATTER PLOT

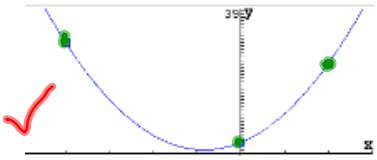


LINEAR MODEL $y=x$

Not Enough Elements

Press: [EXIT]

CUBIC MODEL $y=x^3$ (NO ANSWER)



QUADRATIC MODEL $y=x^2$

Not Enough Elements

Press: [EXIT]

QUARTIC MODEL $y=x^4$ (NO ANSWER)

Regression (Given A Graph you give me an equation)

QuadReg
a =3
b =5
c =3
r^2 =1
MSe=
$y=ax^2+bx+c$

$y=ax^2+bx+c$

$y=3x^2+5x+3$ Best that I can find!

coefficient of correlation (Connect)

-1 r 1

Stronger Connection — Strongest Connection

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To check my Answer: $(-4,31)(2,25)(0,3)$

$y = ax^2 + bx + c$

$y = 3x^2 + 5x + 3$ ← REPLACE

Check

$31 = 3(-4)^2 + 5(-4) + 3 \Rightarrow 31 = 31$

$25 = 3(2)^2 + 5(2) + 3 \Rightarrow 25 = 25$

$3 = 3(0)^2 + 5(0) + 3 \Rightarrow 3 = 3$

I- The (n+1) Point Principle

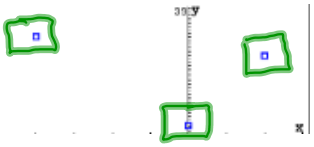
1) X number of non-collinear points determines a Polynomial Function of degree X-1.

2) If you have 4 non-collinear points then the degree of the Polynomial Function is 3

from the DO NOW (-4,31) (2,25) (0,3)

WE HAD 3 non-collinear points

(Not all on the same line)



∴ your answer will be (n-1) = 3-1

x^2

3) (-4, 31), (2, 25) and (0, 3) Determine a Polynomial Function of degree 2

4) $y = ax^2 + bx + c$

5) Replace each coordinate point to get 3 linear equations in 3unknows.

$Y = ax^2 + bx + c$

For (-4, 31)

$31 = a(-4)^2 + b(-4) + c$

Continue... for (2,

$31 = 3(-4)^2 + 5(-4) + 3$

$25 = 3(2)^2 + 5(2) + 3$

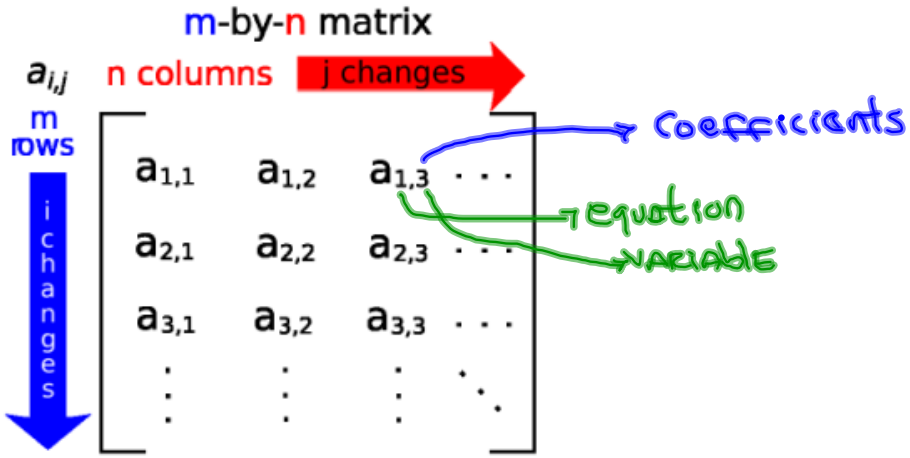
$3 = 3(0)^2 + 5(0) + 3$

⇒ Matrix

(2, 25) (0, 3)

II – Matrices

1 –



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2- Use Matrices to Solve System of Equations

n = 3

For example

$$\begin{bmatrix} -4 & 1 & 6 \\ -5 & -1 & 21 \end{bmatrix} \quad m = 2$$

$$-4x + y = 6$$
$$-5x - y = 21$$

Method of Elimination

$x = -3$

$y = -6$

See below for another method to solve by using the calculator

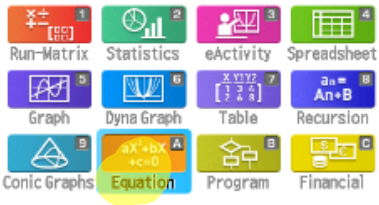
Ans	1	2	3
1	1	0	-3
2	0	1	-6

Let's use the calculator matrix package...

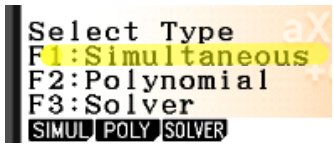
3- Let's go back to our problem

$$31 = a(-4)^2 + b(-4) + c$$
$$25 = a(2)^2 + b(2) + c$$
$$3 = a(0)^2 + b(0) + c$$

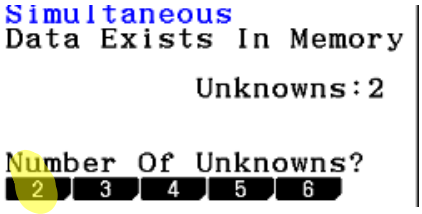
1)



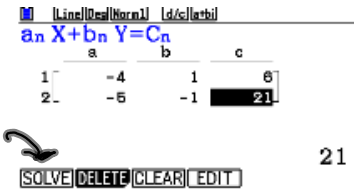
2)



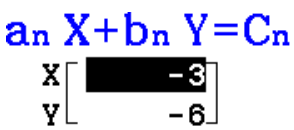
3)



4)



5)

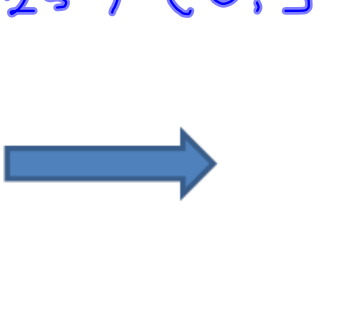


(-4, 31) (2, 25) (0, 3)

$31 = 16a - 4b + 1c$

$25 = 4a + 2b + 1c$

$3 = 0a + 0b + 1c$



Ans	1	2	3	4
1	1	0	0	3
2	0	1	0	5
3	0	0	1	3

Answer Matrix
Coefficients of the best fit Equation

II- A Geometric Interpretation (use the calculator)

1) Let's Use a Graph to probe that a quadratic regression is the best fit

2) Lets' use a quadratic regression to get the quadratic equation.

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Do Now: Find a polynomial function whose graph passes through each set of points: $(-4, 31)$, $(2, 25)$, and $(0, 3)$

H.S. thinking:
3 non-collinear pt.
∴ Degree = 2
∴ need a Quadratic (2) equation
use regression

QuadReg
a =3
b =5
c =3
r^2 =1
MSe=
$y=ax^2+bx+c$
COPY

Equation
$y = 3x^2+5x+3$