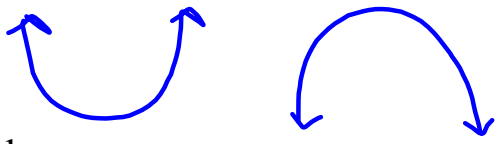
Quadratic models

Quadratic Models



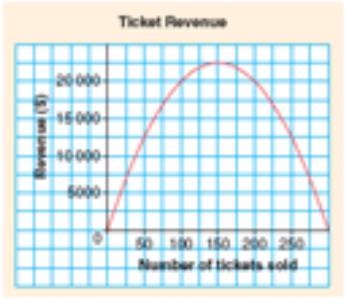
- graph is a curve
- curve is called a parabola
- equation is in the form of $y=ax^2+bx+c$

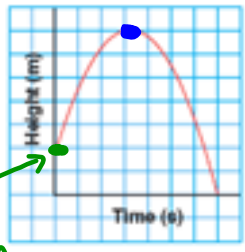
ex. $y=3x^2+5x-8$

- equation must have an x^2

Quadratic Models

- Quadratic models have a parabola shape.
- Parabolas can open up or down.
- Parabolas have a maximum or minimum point called a vertex.





doesn't have to start at the origin

- In a table of values, the 2nd differences are same

h	p
0	250
1	238
2	202
3	142

First Differences	Second Differences
238 - 250 = -12	
202 - 238 = -36	-36 - (-12) = -24
142 - 202 = -60	-60 - (-36) = -24

different ∴ not linear

same ∴ quadratic

→ line of best fit

Fitting Regression Models to Data

We can use quadratic regression to model data that appear to relate in this way.

- The regression line or curve can be fitted to the data points and used for analysis and to make predictions
- The closer the line or curve is to the data points, the more accurate the predictions are likely to be.

Quadratic Model Example

The following table shows the height of sparks from fireworks flying through the sky at various horizontal distances from the starting location.

Distance (m)	5	10	15	20	25	30
Height (m)	43	75	97	108	109	100

Data • Stats

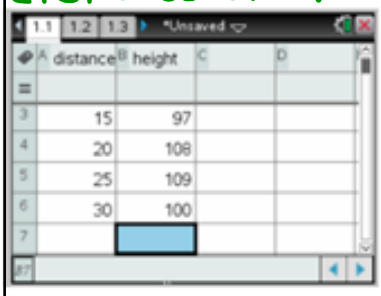
Menu Analyze Regression Quadratic

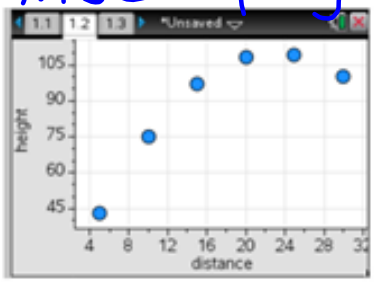
•Using a graphing calculator:

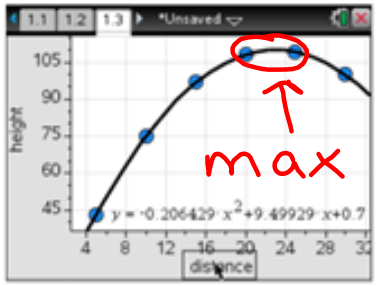
a) Determine the equation of the parabola of best fit.

new document Lists and s.

doc insert page







c)Determine the maximum of the regression curve. What does it represent?

The maximum of the curve is (23, 110) m.

This means that the maximum height that the sparks reached is 110 m.

Examples:

State if the functions are linear, quadratic or neither.

$y=5x+2x^2$ quadratic

$y=5x-2$ linear $y=mx+b$

$y=(x+3)(x-7)$ → $x^2+3x-7x-21$ quadratic

$y=4^x$ neither → exponential

$y=9-2x$ linear

$y=3x^4+x^2+1$ neither

On which graph does the point (2,3) lie?

$y=x^2-5x+11$ or $y=x^2-6x+11$

Sub in
$x=2$
$y=3$
Check both sides

$3 \stackrel{?}{=} 2^2-5(2)+11$

$3 \stackrel{?}{=} 4-10+11$

$3 \neq 5$

∴ not on line

$3 \stackrel{?}{=} 2^2-6(2)+11$

$3=4-12+11$

$3=3$

∴ on the line

Seatwork

pg 303 # 1-7