Writing Equations of Quadratics

$y = ax^2 + bx + c$

or

$h = at^2 + bt + c$

Objective: Find a, b and c.

Nov 24-2:00 PM

- Make a table. ← find ans. from calculator. Stat edit Stat calc.
- Write the equation/formula.
- Check to see if you have the "c" value, if so, substitute the value into the equation for "c".
- Substitute the three (or two if you had c) values for h and t (or x and y) and set up a system of equations.
- Solve the system of equations.
- Write the quadratic function.

Nov 24-2:20 PM

Q1: An object is thrown up into the air. After 2 seconds the object is at a height of 296 m. After 4 seconds the object is at a height of 264 m and after 5 seconds the object is at a height of 200 m. Determine the equation of the quadratic function that models the situation.

t	2	4	5
h	296	264	200

L1
L2
> Stat, Edit

L1	L2
2	296
4	264
5	200

STAT, CALC: 5:

Nov 24-2:08 PM

t	2	4	5
h	296	264	200

$h = at^2 + bt + c$

(2, 296)

$296 = a(2)^2 + b(2) + c$

$296 = 4a + 2b + c$ *

(4, 264)

$264 = a(4)^2 + b(4) + c$

$264 = 16a + 4b + c$ *

(5, 200)

$200 = a(5)^2 + b(5) + c$

$200 = 25a + 5b + c$ *

Oct 24-10:15 AM

$h = at^2 + bt + c$

$296 = 4a + 2b + c$ *

$264 = 16a + 4b + c$ *

$200 = 25a + 5b + c$ *

$-296 = -4a - 2b - c$

$264 = 16a + 4b + c$

$-32 = 12a + 2b$ *

Nov 26-12:57 PM

$[A] \times [B] = [C]$

$\begin{bmatrix} 4 & 2 & 1 \\ 16 & 4 & 1 \\ 25 & 5 & 1 \end{bmatrix} \times \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} 296 \\ 264 \\ 200 \end{bmatrix}$

$[B] = [A]^{-1} \times [B]$

$\begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} \frac{1}{6} & -\frac{1}{2} & \frac{1}{3} \\ \vdots & \vdots & \vdots \end{bmatrix} \times \begin{bmatrix} 296 \\ 264 \\ 200 \end{bmatrix}$

$\begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} -16 \\ 80 \\ 200 \end{bmatrix}$

$h = -16t^2 + 80t + 200$

Oct 25-8:29 AM

Q2:
A soccer ball is kicked from a platform that is 5 m above the ground. After 5 seconds, the ball is at a height of 205 m. After 9 seconds, the ball is at a height of 221 m. Determine the equation of the quadratic function that models the situation.

t	0	5	9
h	5	205	221

$h = at^2 + bt + c$

$h = at^2 + bt + 5$

Nov 24-2:41 PM

$205 = a(5)^2 + b(5) + 5$

$200 = 25a + 5b$ *

$221 = a(9)^2 + b(9) + 5$

$216 = 81a + 9b$ *

$25a + 5b = 200$

$81a + 9b = 216$

$h = -4t^2 + 60t + 5$

Nov 27-8:37 AM

A rocket is fired down a practice range. The rocket follows a parabolic path. After 10 seconds, the rocket reaches a height of 1500 m. The height is 2000 m after 20 seconds and 1500 m after 40 seconds. Find the equation of the quadratic function that models the situation.

t	10	20	40
h	1500	2000	1500

$h = -2.5t^2 + 125t + 500$

Nov 24-2:18 PM

Q4: Work Sample #9

Shana sells her wildlife pictures at the fair. Her revenue follows a quadratic function. At a price of $40, her revenue is $2900. At a price of $50, her revenue is $3000. At a price of $70, her revenue is $2600. Find the equation of the quadratic function that models the situation.

$R = ap^2 + bp + c$

Nov 24-2:19 PM

Q5:

A model rocket is shot into the air. Its approximate height each second is recorded in the table below.

Time (s)	0	1	2	3
Height (m)	5	117	213	293

Find the equation of the quadratic function that models the situation.

Nov 24-2:43 PM

6. A ball is thrown into the air. After 2 seconds the ball is at a height of 170 m, after 4 seconds the ball is at a height of 314m and after 5 seconds the ball is at a height of 377m. Find the equation of the quadratic function that models the situation.

Nov 24-2:25 PM