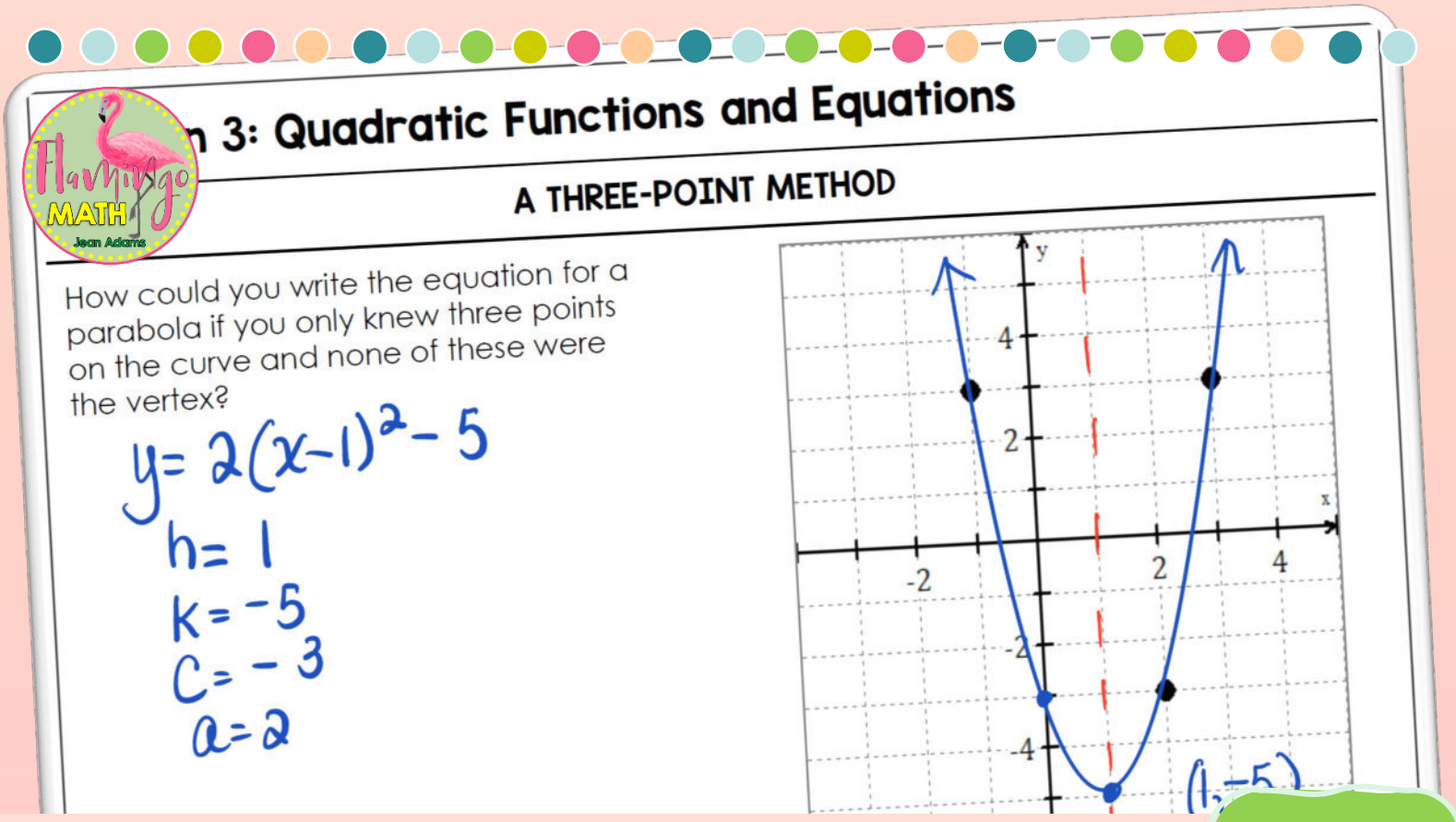
Algebra 2 Honors

Modeling With Quadratic Functions



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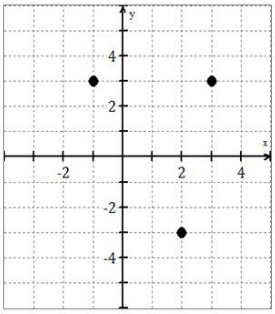
4.3

Lesson 3: Quadratic Functions and Equations

A THREE-POINT METHOD

How could you write the equation for a parabola if you only knew three points on the curve and none of these were the vertex?



Writing an Equation of a Parabola

EX #1: A parabola contains the points $(-1,3)$, $(2,-3)$, and $(3,3)$. Find the equation of this parabola in standard form.

PROCEDURE:

STEP 1: Create a system of equations by substituting the given points.

STEP 2: Solve the system to find *a*, *b*, and *c*.

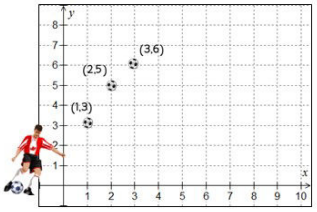
STEP 3: Write the equation in standard form.

Writing an Equation $f(x) = ax^2 + bx + c$

EX #2: Find the equation for a parabola passing through $(1,-2)$, $(2,-4)$, and $(3,-4)$.

Using a Quadratic Model

EX #3: The parabolic path of a soccer ball can be modeled by the graph at right. The top of the goal cage is at (5,6). Will the ball go over the goal? If not, will it hit the goal? Explain.



Using Quadratic Regression

Use a graphing calculator to find a quadratic model for the predicted temperatures in San Francisco, CA in October.

PROCEDURE FOR TI-84:
Use a 24-hour clock to enter the time after noon.

STEP 1:
Press STAT 1: to enter lists.
STEP 2:
Turn Plot ON
STEP 3:
View data points by pressing ZOOM 9:
STEP 4:
Find regression equation by pressing STAT: CALC: 5:
Be sure Xlist and Ylist reads L1 and L2.
Place your cursor in Store RegEQ:
Press VARS:Y-Vars:1:1:
STEP 5:
Press ENTER to CALCULATE, write the equation.
STEP 6:
Look at data or use MAXIMUM feature to predict high temperatures.

TIME	PREDICTED TEMP. (°F)
8 A.M.	52
10 A.M.	64
12 P.M.	72
2 P.M.	78
4 P.M.	81
6 P.M.	76

EX #4: The table below shows the predicted temperatures for a summer day in Denver, CO. Find a quadratic model for this data. Predict the high temperature for the day. When does the high temperature occur?

TIME	PREDICTED TEMP. (°F)
6 A.M.	63
8 A.M.	76

Extension

EX #5: The table below gives the stopping distance for an automobile under certain road conditions.

Speed (mi/hr)	20	30	40	50	55
Stopping Distance (ft)	17	38	67	105	127

A. Find a linear model for the data.

B. Find a quadratic model for the data.

C. Compare the models. Which is better? Explain.

NOTES

Name _____ Date_____

4.3

Modeling with Quadratic Functions Practice

Problems 1 – 4, find an equation in standard form of the parabola passing through the points.

1. $(-1,2),(1,8),(-3,4)$

2. $(-1,3),(1,-11),(8,3)$

3. $(-1,-4),(2,5),(4,-9)$

4. $(-2,19),\left(1,-\frac{1}{2}\right),(4,-11)$

Problems 5 – 7, solve.

5. Tommy throws a ball off the top of a building and Allie records the height of the ball at different times, shown in the table.

Time	Height (ft.)
0	50

A. Find a quadratic model for the data.

B. Use the model to estimate the height of the ball at 2.5 seconds.

C. What is the ball's maximum height?

6. The table gives the number of scuba dive trips sold at a tropical resort.

Month	Scuba Trips
April	36
May	52
June	84

A. Find a quadratic model for the data, using April as month 1, May as month 2, and so on.

B. Use the model to predict the number of scuba dive trips sold in August.

7. On a suspension bridge the roadway is hung from cables hanging between support towers. The cable of one bridge is in the shape of the parabola $y = 0.1x^2 - 6x + 110$, where y is the height in feet of the cable above the roadway at the distance, x feet from a support tower.

A. What is the closest the cable comes to the roadway?

B. How far from the support tower does this occur?

8. Abigail wants to build a fence around a rectangular area for a garden. She has 150 feet of fencing, and she wants to leave a 10-foot opening on one side for a gate. In order to make the area of the garden a maximum, what should the dimensions of the garden be?

Practice Sets

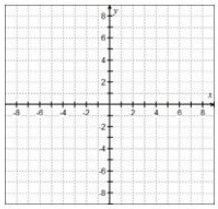
Lesson Warm-Ups

Name _____ Date _____ Period _____

Lesson 4.3: Modeling with Quadratic Functions **Warm-Up # 1**

1. Use a matrix to find the equation of a parabola passing through $(-2, 8)$, $(-1, 5)$, and $(0, 4)$. Write your answer in standard form.

2. Find the vertex and sketch the graph.



Name _____ Date _____

Lesson 4.3: Modeling with Quadratic Functio

1. Use a matrix to find the equation of a parabola passing through $(-3, 4)$, $(-2, 1)$, and $(1, 4)$. Write your answer in standard form.

2. Find the v

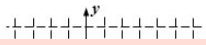
4.3 Modeling with Quadratic Functions **Form A**

Name _____

Date _____ Period _____

1. Use a matrix to find the equation for a parabola passing through $(-1, 5)$, $(1, -3)$ and $(3, 5)$. Write your answer in standard form.

2. Find the vertex for the parabola above and sketch here.



Grade:

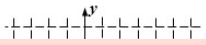
4.3 Modeling with Quadratic Functions **Form B**

Name _____

Date _____ Period _____

1. Use a matrix to find the equation for a parabola passing through $(-2, -3)$, $(1, 3)$ and $(2, 13)$. Write your answer in standard form.

2. Find the vertex for the parabola above and sketch here.



Grade:

Daily Lesson Quiz