4.3 Practice Worksheet

For problems 1-4, find an equation in standard form of the parabola passing through the given points.

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

$a(-1)^2+b(-1)+c=2$
$a(1)^2+b(1)+c=8$
$a(-3)^2+b(-3)+c=4$

$\begin{cases} 1a-1b+c=2 \\ 1a+1b+c=8 \\ 9a-3b+c=4 \end{cases}$

$\begin{bmatrix} 1 & -1 & 1 & 2 \\ 1 & 1 & 1 & 8 \\ 9 & -3 & 1 & 4 \end{bmatrix} \xrightarrow{\text{rref}} \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 4 \end{bmatrix}$

$y = x^2+3x+4$

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

$a(-1)^2+b(-1)+c=4$
$a(2)^2+b(2)+c=5$
$a(4)^2+b(4)+c=+9$

$\begin{cases} 1a-b+c=4 \\ 4a+2b+c=5 \\ 16a+4b+c=+9 \end{cases}$

$\begin{bmatrix} 1 & -1 & 1 & 4 \\ 4 & 2 & 1 & 5 \\ 16 & 4 & 1 & +9 \end{bmatrix} \xrightarrow{\text{rref}} \begin{bmatrix} 1 & 0 & 0 & 1/3 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 3\frac{2}{3} \end{bmatrix}$

$y = \frac{1}{3}x^2 + \frac{11}{3}$

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

$a(-1)^2+b(-1)+c=3$
$a(1)^2+b(1)+c=-11$
$a(8)^2+b(8)+c=3$

$\begin{cases} a-b+c=3 \\ a+b+c=-11 \\ 64a+8b+c=3 \end{cases}$

$\begin{bmatrix} 1 & -1 & 1 & 3 \\ 1 & 1 & 1 & -11 \\ 64 & 8 & 1 & 3 \end{bmatrix} \xrightarrow{\text{rref}} \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & -7 \\ 0 & 0 & 1 & -5 \end{bmatrix}$

$y = x^2-7x-5$

For problems 5-7, solve the provided word problems.

4. 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
1	68
2	54
3	8

a. Find a quadratic model for the data.

$y = -16x^2+34x+50$

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

$-16(2.5)^2+34(2.5)+50 = 35$ ft

c. What is the ball's maximum height?

$\frac{-34}{2(-16)} = 1.0625$

$-16(1.0625)^2+34(1.0625)+50$

68.06 ft

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

Month	Scuba Trips
1 April	36
2 May	52
3 June	84

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

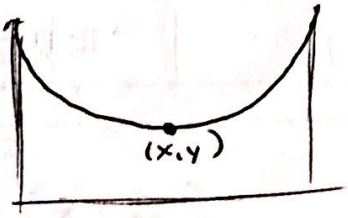
$y = 8x^2 - 8x + 36$

b. Use the model to predict the number of scuba dive trips sold in August. 5

$8(5)^2 - 8(5) + 36$

196 trips

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 a 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?

20 ft

b. How far from the support tower did this occur?

30 ft

$x \rightarrow$ ft from ~~road~~ tower

$y \rightarrow$ ht from road

$\frac{6}{2(.1)} = 30$

$.1(30^2) - 6(30) + 110 = 20$

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?

P: $2x + 2y - 10 = 150$

$2x + 2y = 160$

$x + y = 80$

$y = 80 - x$

A: xy

$A = x(80 - x)$

$A = -x^2 + 80x$

$\frac{-80}{2(-1)} = 40$

40 by 40