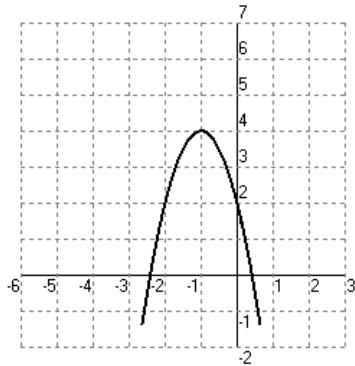


# Curve Fitting: Modeling with Quadratic Functions

## Practice Problems

Write a quadratic function in vertex form for the parabola with the given characteristics.

1.

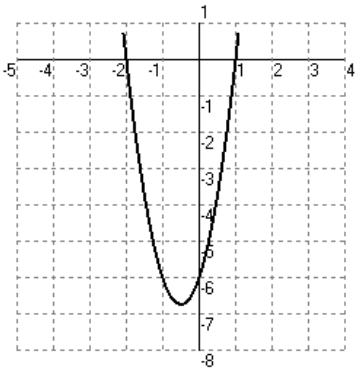


2. Vertex:  $(1, -10)$  and a point:  $(-3, 54)$

3. Vertex:  $(-4, 6)$  and a point:  $(-1, 9)$

Write a quadratic function in vertex form for the parabola with the given characteristics.

4.

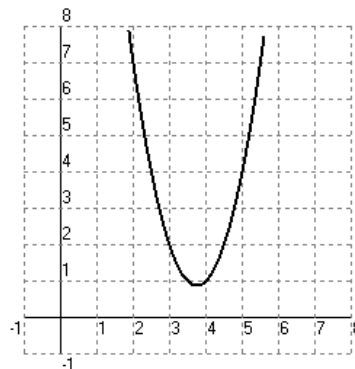


5.  $x$ -intercepts:  $-2, 2$  and a point:  $(-4, 8)$

6.  $x$ -intercepts:  $1, 4$  and a point:  $(3, 2)$

Write a quadratic function in vertex form for the parabola with the given characteristics.

7.

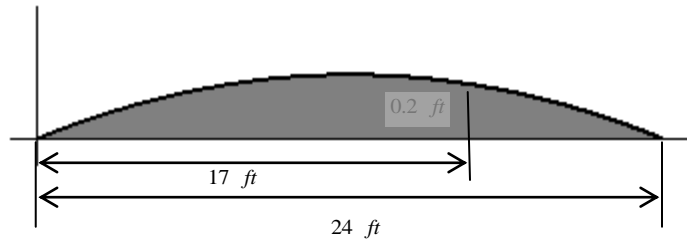


8. Points:  $(1, 2)$ ,  $(3, 4)$ , and  $(6, -8)$

9. Points:  $(-2, -1)$ ,  $(1, 11)$ , and  $(2, 27)$

## Applications

10. Transportation. The surfaces of some roads are shaped like parabolas to allow rain to run off to either side. Write a quadratic model for the surface of the road shown.



11. Botany. Amaranth is a type of vegetable commonly grown in Asia, West Africa, and the Caribbean. When amaranth plants are grown in rows, the height that the plants attain is a quadratic function of the spacing between plants within a row. According to one study, the minimum height of the plants, about 16 cm, occurred when the plants were spaced about 27 cm apart. The study also found that the plants grew to about 20 cm when spaced about 40 cm apart. Write a quadratic model giving the plant height  $h$  as a function of the spacing  $s$ .
12. Running. The table below shows how wind affects a runner's performance in the 200 meter dash. Positive wind speeds correspond to tailwinds, and negative wind speeds correspond to headwinds. Positive changes in finishing time mean worsened performance, and negative changes mean improved performance. Determine a quadratic model for the change  $t$  in finishing time as a function of the wind speed  $s$ .

Wind Speed (m/sec) $s$	- 6	- 4	- 2	0	2	4	6
Change in Finishing Time (sec) $t$	2.28	1.42	0.67	0	- 0.57	- 1.05	- 1.42

13. A bank adjusts its interest rates for new certificates of deposits daily. The table shows the interest rates on the first day of the month for January through May.

Month	0	1	2	3	4
Rate	3.9	4.4	4.6	3.8	3.1

- Find the best-fitting quadratic model for the data. Use three significant digits in your decimal approximations.
- According to the model, during which month did the certificates of deposit have the highest rate? What was that rate?