PRACTICE & PROBLEM SOLVING

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Practice Tutorial

Additional Exercises Available Online

UNDERSTAND

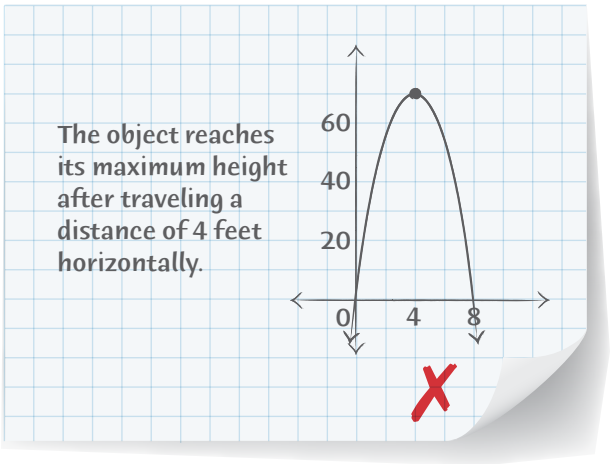
9. Make Sense and Persevere For each vertical motion model, identify the maximum height reached by the object and the amount of time the object is in the air before it hits the ground.

a. $h(t) = -16t^2 + 200t + 25$

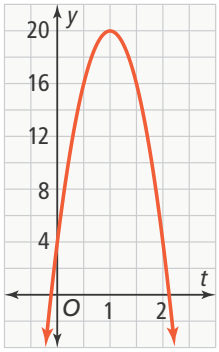
b. $h(t) = -16t^2 + 36t + 4$

10. Reason When a student uses quadratic regression on a graphing calculator to model data, the value of R^2 is 0.2. Make a conjecture about the fit of the model.

11. Error Analysis Describe and correct the error a student made when interpreting the graph of the vertical motion model $h(t) = -at^2 + bt + c$.



12. Look for Relationships In the graph of a vertical motion model shown, how is the initial velocity related to the vertex of the parabola?



13. Higher Order Thinking The function $f(x) = x^2 + 3x - 10$ models the area of a rectangle.

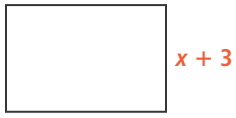
a. Describe the length and width of the rectangle in terms of x.

b. What is a reasonable domain and range for the situation? Explain.

PRACTICE

Use a quadratic function to model the area of each rectangle. Graph the function. Evaluate each function for $x = 8$. SEE EXAMPLE 1

14.



15.

Write a function h to model the vertical motion for each situation, given $h(t) = -16t^2 + v_0t + h_0$. Find the maximum height. SEE EXAMPLE 2

16. initial vertical velocity: 32 ft/s initial height: 75 ft

17. initial vertical velocity: 200 ft/s initial height: 0 ft

18. initial vertical velocity: 50 ft/s initial height: 5 ft

19. initial vertical velocity: 48 ft/s initial height: 6 ft

Make a scatterplot of the data and graph the function on the same coordinate grid. Calculate the residuals and make a residual plot. Describe the fit of the function to the data. SEE EXAMPLE 3

20. $f(x) = 2x^2 - x + 1$

x	y
−2	13
−1	8
0	6
1	9
2	12

21. $f(x) = -x^2 + 3x + 2$

x	y
−2	−6
−1	−1
0	3
1	4
2	3

Use a graphing calculator to find a quadratic regression for each data set. Round values to the nearest ten-thousandth. SEE EXAMPLE 4

22.

x	y
0	15.50
1	11.21
2	8.43
3	5.67
4	3.43

23.

x	y
100	567.3
500	443.2
900	362.3
1,300	312.2
1,700	307.3

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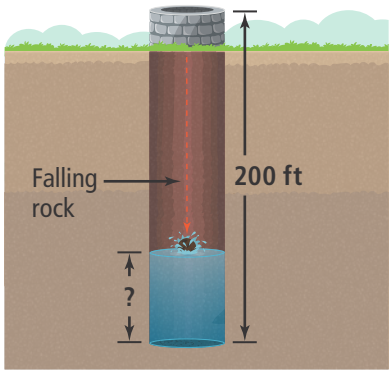
Mixed Review Available Online

APPLY

24. Model With Mathematics A student drops a rock over the edge of the well and hears it splash into water after 3 seconds. Write a function in the form $h(t) = -16t^2 + v_0t + h_0$ to determine the height of the rock above the bottom of the well t seconds after the student drops the rock. What is the distance from the surface of the water to the bottom of the well?



25. Construct Arguments The table below shows profits for a new model of headphones as a function of price x. The manufacturer says the price should be set at $15 to maximize profits. Do you agree? Justify your answers.

Price ($)	Profit ($ thousands)
16	240
17	223
18	200
19	173
20	140

26. Mathematical Connections Dakota bought 120 ft of wire fencing at $0.50/ft to enclose a rectangular playground. The playground surface will be covered with mulch at a cost of $1.25/ft^2. Write a quadratic function that can be used to determine the total cost of fencing and mulch for a playground with side length x. What is the cost if one side is 20 ft?

ASSESSMENT PRACTICE

27. The function $h(t) = -16t^2 + 96t + 10$ models the path of a projectile.

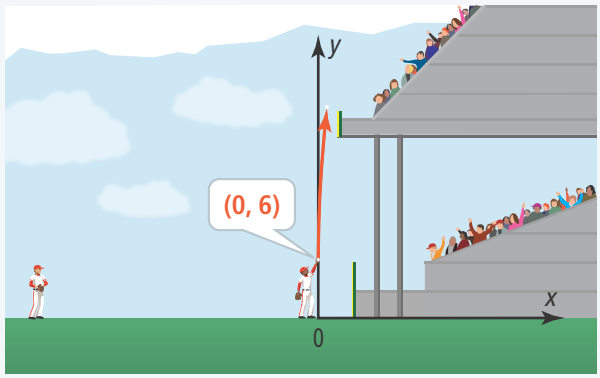
By inspecting the function you can tell that the initial height of the projectile is _____ ft, and the initial velocity is _____ ft/s.

The projectile reaches a maximum height of _____ ft at time _____ s.

28. SAT/ACT A basketball is thrown straight up into the air from a height of 2.1 ft with an initial velocity of 7 ft/s. Which function models the height of the ball after t seconds?

Ⓐ $h(t) = -16t^2 + 2.1t + 7$
Ⓑ $h(t) = -16t^2 - 2.1t + 7$
Ⓒ $h(t) = -16t^2 + 2.1t - 7$
Ⓓ $h(t) = -16t^2 + 7t + 2.1$
Ⓔ $h(t) = -16t^2 - 7t + 2.1$

29. Performance Task A baseball player is standing 1.5 ft away from the edge of the upper deck that is 20 ft above the baseball field. He throws a ball into the air for the fans sitting in the upper deck.



Part A Write a quadratic function that can be used to determine the height of the ball if it is thrown at an initial velocity of 35 ft/s from a height of 6 ft. Graph the function.

Part B The seats for the upper deck start 2 ft from the edge. Will the ball land on the upper deck?