PRACTICE/HOMEWORK

Use the scenario below to answer questions 1 – 5.

SPORTS

A football is punted up into the air. The football reaches a maximum altitude, and then comes back to the ground. The relationship between x, the number of seconds since the ball has been punted, and $f(x)$, the height of the ball in feet, is represented by the function $f(x) = -16x^2 + 40x + 4$.

1. Use a graphing calculator to complete the table below.

NUMBER OF SECONDS, x	0	0.25	0.5	0.75	1	1.25	1.5	1.75	2	2.25	2.5
HEIGHT OF BALL, y											

2. Based on the table values, when does the ball stop increasing in height and start decreasing in height?

3. What is the maximum height of the ball?

4. When is the ball 20 feet above the ground?

5. What do the points (0, 4) and (2.5, 4) represent in the scenario?

Use the scenario below to answer questions 6 – 11.

ART AND ARCHITECTURE

A small town is building a park in the center of town. The city has a rectangular plot of land measuring 150 feet by 300 feet. The city plans on building a sidewalk x feet wide around the perimeter of the lot. The area bounded by the sidewalk, $f(x)$, is represented by the function $f(x) = (150 - 2x)(300 - 2x)$ or $f(x) = 4x^2 - 900x + 45{,}000$.

6. Using a graphing calculator, plot the graph of the function.

7. The city wants to build a sidewalk wide enough to leave an area of land 36,400 square feet contained by the sidewalk. Write an equation that could be used to determine the width, x, of the sidewalk.

8. Plot the line $y = 36{,}400$ over the function graphed in problem 6.

9. What are the coordinates of the points of intersection on the graph in problem 8?

10. What do these points represent in the scenario?

11. Do both points make sense in the scenario?

Use the scenario below to answer questions 12 – 16.

SCIENCE

A model rocket is launched at ground level with an initial velocity of 80 feet per second. The function $f(x)$ represents the relationship between x, the number of seconds since the rocket was launched, and $f(x)$, the height of the rocket in feet. The function representing this relationship is $f(x) = -16x^2 + 80x$.

12. Write an equation that can be used to determine when the rocket will be at a height of 64 feet.

13. Solve the equation you wrote in problem 12.

14. Write and solve an equation to determine the time(s) the rocket will be at a height of 84 feet.

15. Write and solve an equation to determine the time(s) the rocket will be at a height of 100 feet.

16. How is the solution(s) to the equation in problem 15 different from the solution(s) to the equation in problem 14? Why is it different?

Use the scenario below to answer questions 17 – 22.

CITY PLANNING

A large city conducted a traffic study at one of their busiest intersections. A machine is set up to record the number of vehicles that pass through the intersection at 15-minute intervals. The machine reports the number of vehicles at the end of each interval. The function $f(x)$ shown below represents the relationship between x, the number of 15-minute intervals, and $f(x)$, the number of cars that pass through the intersection.

$$f(x) = -12x^2 + 88x + 100$$

17. Write an equation that could be used to determine at the end of what interval did 260 cars pass through the intersection.

18. Solve the equation in problem 17 algebraically.

19. Do both solutions make sense in the scenario? Why or why not?

20. Write an equation that could be used to determine at what interval did 128 cars pass through the intersection.

21. Solve the equation in problem 20 algebraically.

22. Do both solutions make sense in the scenario? Why or why not?

For questions 23 – 25, choose a method for solving the equation (graph, table, or algebraically), solve the equation, and record the solutions.

23. $6x^2 + 42x + 72 = 36$

24. $0 = 2x^2 + 13x - 7$

25. $86 = -16x^2 + 70x + 10$