YOU TRY IT! #3

The power, y, (in kilowatts) generated by a wind turbine is related to the wind speed. Determine if the data set represents a linear, quadratic, or cubic function. Identify the domain and range of the model that most appropriately models the data.

AVERAGE ANNUAL WIND SPEED IN THE USA IN METERS PER SECOND, x	ANNUAL ENERGY OUTPUT IN KWH/YEAR, $f(x)$
4	3.40
5	6.64
6	11.47
7	18.22
8	27.25
9	38.75
10	53.12

Data Source: National Renewal Energy Laboratory and Energy.gov

PRACTICE/HOMEWORK

For questions 1 – 6, use finite differences to determine if the data sets shown in the tables below represent a linear, exponential, quadratic, or cubic function.

1.

x	y
0	3
1	6
2	12
3	24
4	48
5	96

2.

x	y
0	-6
1	1
2	16
3	39
4	70
5	109

3.

x	y
0	2.25
1	8.75
2	15.25
3	21.75
4	28.25
5	34.75

4.

x	y
0	5
1	10
2	35
3	92
4	193
5	350

5.

x	y
0	20
1	50
2	125
3	312.5
4	781.25
5	1953.125

6.

x	y
0	-8
1	3
2	44
3	145
4	336
5	647

For questions 7 – 12, the data sets shown in the tables represent cubic functions. Use finite differences to determine the function that relates the variables.

7.

x	y
0	-1
1	0
2	11
3	50
4	135
5	284

8.

x	y
0	3
1	7
2	1
3	-27
4	-89
5	-197

9.

x	y
0	0
1	14
2	72
3	198
4	416
5	750

10.

x	y
0	-4
1	-9
2	-48
3	-157
4	-372
5	-729

11.

x	y
0	1
1	6
2	15
3	31
4	57
5	96

12.

x	y
0	-9
1	-3
2	39
3	153
4	375
5	741

For questions 13 – 17 use the scenario below.

GEOMETRY

A box is created from a 20-inch by 24-inch rectangular piece of cardboard by cutting congruent squares from each corner. The squares are cut in 1-inch increments. The resulting sides are folded up and taped to form a rectangular prism (open box). The volume of the box is a function of the side length of the square removed from each corner. The table below relates the volume of the box to the side length of the square.

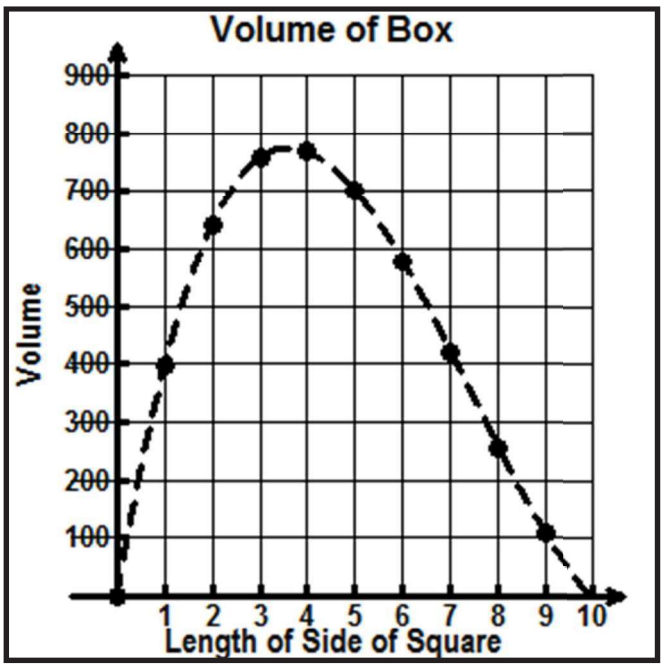
SIDE LENGTH x	VOLUME y
0	0
1	396
2	640
3	756
4	768
5	700
6	576
7	420
8	256
9	108

13. Generate a cubic function model for the volume of tray when given the side length of the square cut from each of the corners.

14. What side length of the square produces a tray with the greatest volume?

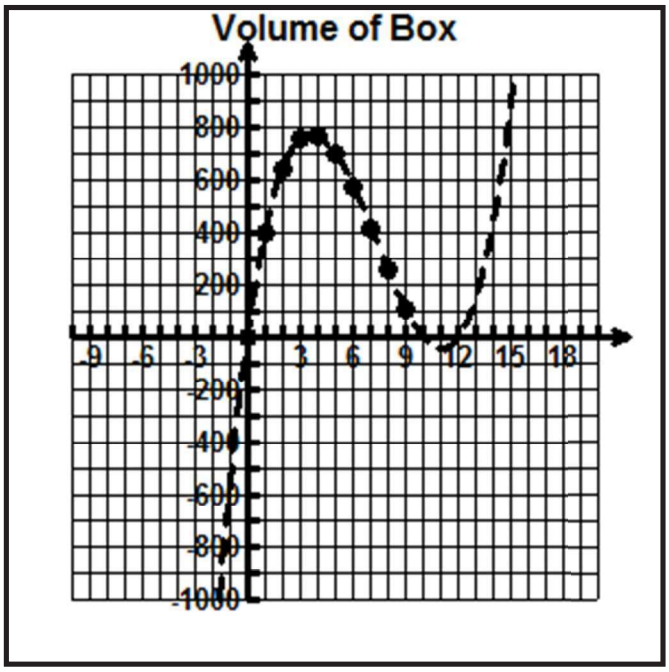
15. The graph to the right represents the data in the table and the function that models the table.

What is the domain and range of this situation?



16. The graph to the right represents the data in the table and the function that models the table, but has been graphed with a different window setting.

Why are there no individual points plotted on the graph for $x < 0$ and $x > 10$?



17. Why does the domain and range only contain whole numbers?

For questions 18 – 22 use the scenario below.

CRITICAL THINKING

An employee at a toy store is creating a display of soccer balls in the shape of a tetrahedron, or an equilateral triangular pyramid.

The table below shows the total number of soccer balls at each level of the display, with Level 1 being at the top of the display.

LEVEL, x	TOTAL NUMBER OF SOCCER BALLS, y
1	1
2	4
3	10
4	20
5	35
6	56

18. Write a function using finite differences that models the data in the table.

19. What does the domain of the function represent in the situation?

20. What does the range of the function represent in the situation?

21. Is 2.5 an element in the domain of this situation? Why or why not?

22. How many soccer balls would be needed to build a display 10 levels high?