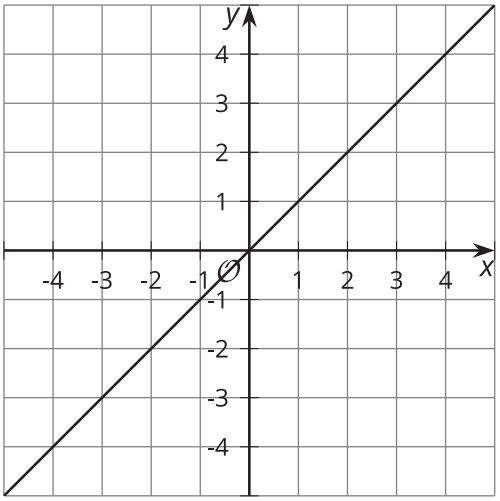
Skills for Modeling with Mathematics

Let's model some situations with mathematics.

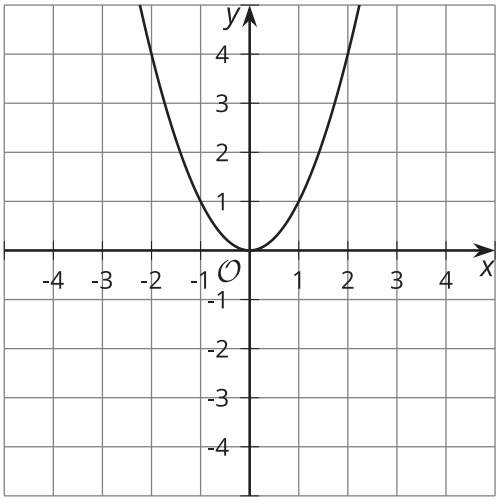
11.1 Which Three Go Together: Four Graphs

Which three go together? Why do they go together?

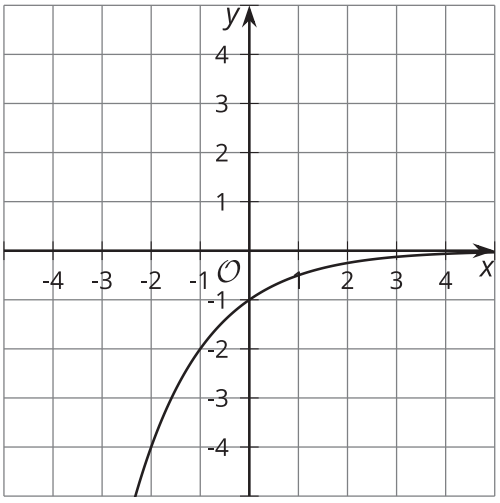
A



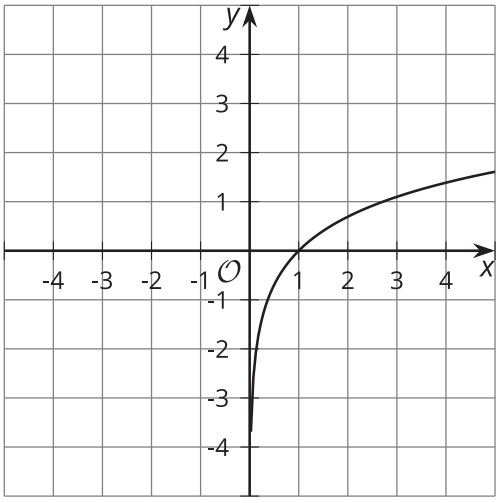
B



C



D



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11.2 Which Model?

1. Consider each situation:
   a. A person starts with $24,000 in a savings account. Each month, she deposits an additional $2,000 in the account.
   b. A 30-year-old puts $24,000 in a retirement account that increases by 10% each year.
   c. The value of a car depreciates by a factor of $\frac{1}{5}$ of the car's value every year. The car initially costs $24,000.
   d. A farmer has stored 24,000 pounds of grain. His cows eat 4,800 pounds of grain per month.

   Match each situation to one of these tables:

A.

x	y
0	24,000
1	19,200
2	15,360
3	12,288

B.

x	y
0	24,000
1	26,000
2	28,000
3	30,000

C.

x	y
0	24,000
1	19,200
2	14,400
3	9,600

D.

x	y
0	24,000
1	26,400
2	29,040
3	31,944

2. How can you tell if a relationship is linear or exponential?

11.3 Growth of a Small Business

Here are two sets of data representing the annual revenue of two different small businesses for the past ten years. One of them had growth that was approximately linear, and one of them had growth that was approximately exponential. The revenue is expressed in thousands of dollars.

Business A:

year	0	1	2	3	4	5	6	7	8	9
revenue	61.2	68.4	74.9	83.1	88.5	96.4	104.1	109.9	117.0	125.2

Business B:

year	0	1	2	3	4	5	6	7	8	9
revenue	40	47.9	57	70.1	82.4	99.5	118.9	144.1	172.0	205.8

1. Which company's growth could be modeled by a linear function, and which by an exponential function?

2. For the company with exponential growth:
   a. What was the growth factor?
   b. What is an equation that represents the relationship between year and revenue?

3. For the company with linear growth:
   a. What was the rate of change?
   b. What is an equation that represents the relationship between year and revenue?

4. For each business, use technology to make a scatter plot of the data and graph the equation. If the equation does not look like a good model for the data, adjust it until it is a good model.