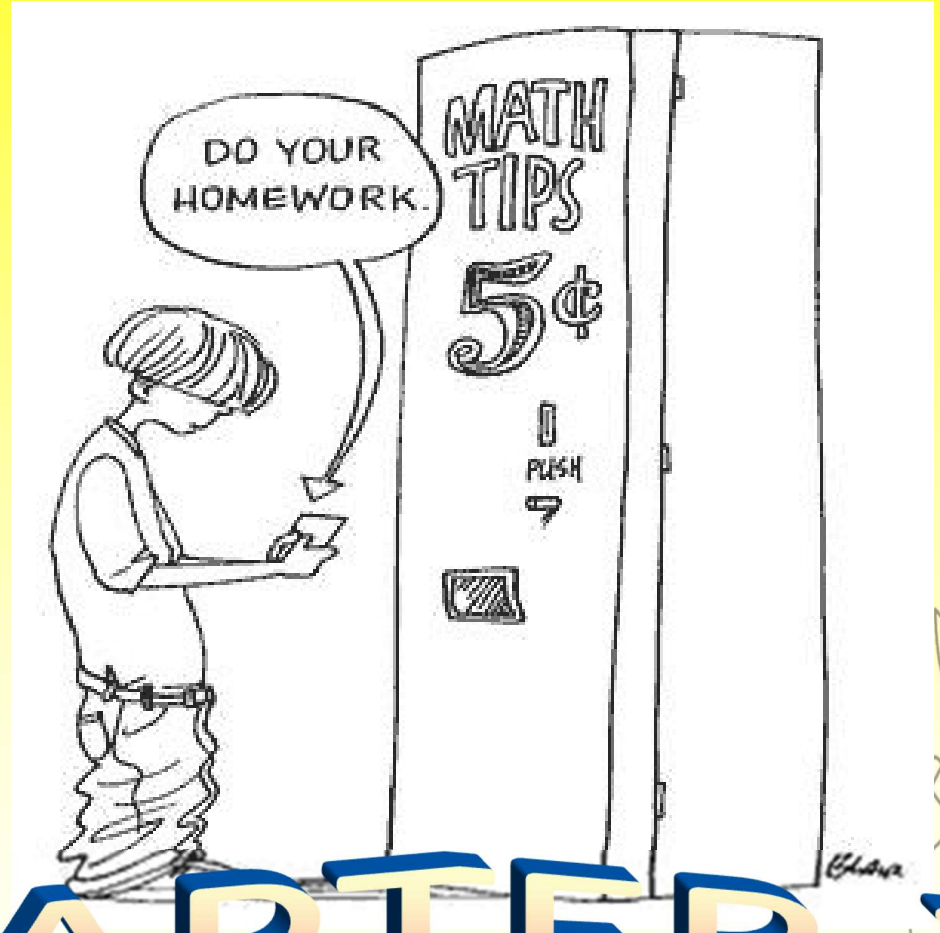
ST. JEAN DE BREBEUF MATHEMATICS



CHAPTER 7.3

INVESTIGATE EXPONENTIAL RELATIONSHIPS

CHAPTER 7.3 INVESTIGATE EXPONENTIAL RELATIONSHIPS

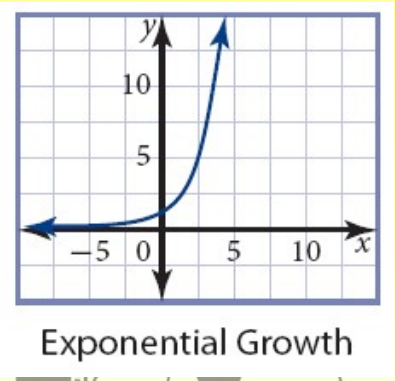
KEY CONCEPTS

An **exponential relation** is a relation that can be represented by the form

$$y = a^x$$

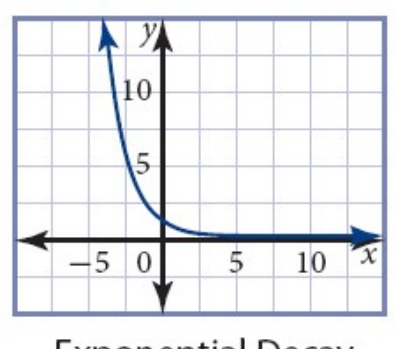
where *a* is a positive constant and $a \neq 1$.

The graph of an exponential relation is a *curve* that is approximately horizontal at one end and *increases* (**exponential growth**)



Exponential Growth

or *decreases* (**exponential decay**) rapidly at the other end.



Exponential Decay

For any exponential relation, the **ratio** between successive terms is constant.
→**Ratios** are calculated by dividing successive *y*-values

CHAPTER 7.3 INVESTIGATE EXPONENTIAL RELATIONSHIPS

EXAMPLE 1 *Identifying Exponential Relationships*

For the table of values below, show that the relation is **exponential**

x	y	Ratios
1	3	
2	9	3
3	27	3
4	81	3
5	243	3
6	729	3

9 / 3 = **3**

27 / 9 = **3**

81 / 27 = **3**

243/ 81 = **3**

729 / 243 = **3**

To calculate the **ratios**, you have to divide successive *y*-values

Since the ratios are constant, this relation is **exponential**

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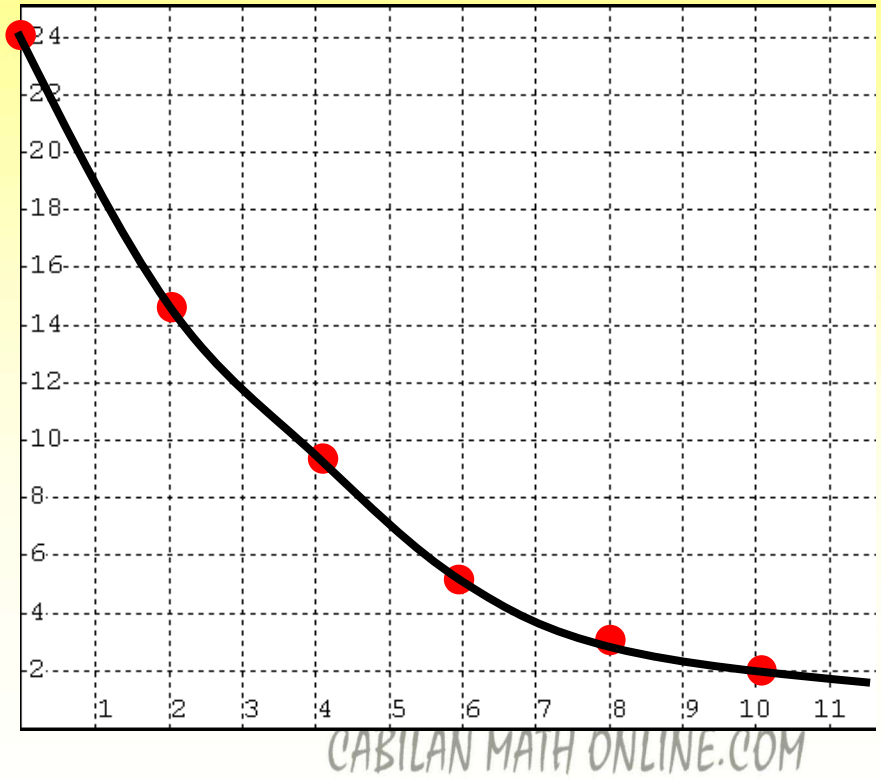
CHAPTER 7.3 INVESTIGATE EXPONENTIAL RELATIONSHIPS

EXAMPLE 2 *Application: Pendulum Motion*

A large pendulum was set in motion. With each complete swing, the pendulum's maximum distance from its rest position decreased. A motion sensor was used to obtain the data after every 2 swings.

(a) Create a **scatterplot** for the data

# of swings	Maximum distance (cm)	Ratios
0	24.00	
2	14.40	
4	8.64	
6	5.18	
8	3.11	
10	1.87	



CHAPTER 7.3 INVESTIGATE EXPONENTIAL RELATIONSHIPS

EXAMPLE 2 *Application: Pendulum Motion*

A large pendulum was set in motion. With each complete swing, the pendulum's maximum distance from its rest position decreased. A motion sensor was used to obtain the data after every 2 swings.

(b) Calculate the **ratios** of the successive *y*-values (in this case, the **distance**). Is this relationship **exponential**? How do you know?

# of swings	Maximum distance (cm)	Ratios
0	24.00	0.6
2	14.40	0.6
4	8.64	0.6
6	5.18	0.6
8	3.11	0.6
10	1.87	

14.4 / 24 = **0.6**

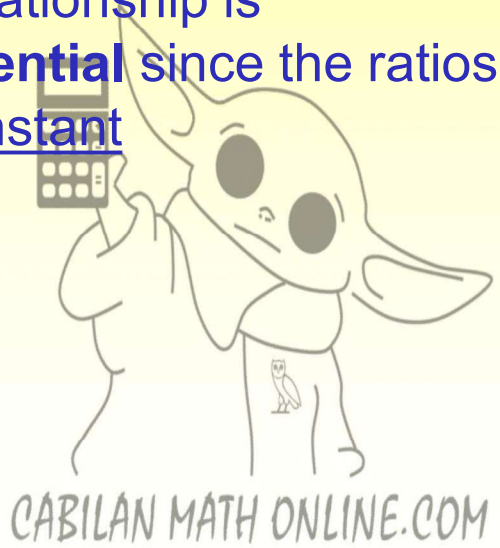
8.64 / 14.4 = **0.6**

5.18 / 8.64 = **0.6**

3.11 / 5.18 = **0.6**

1.87 / 3.11 = **0.6**

The relationship is **exponential** since the ratios are constant



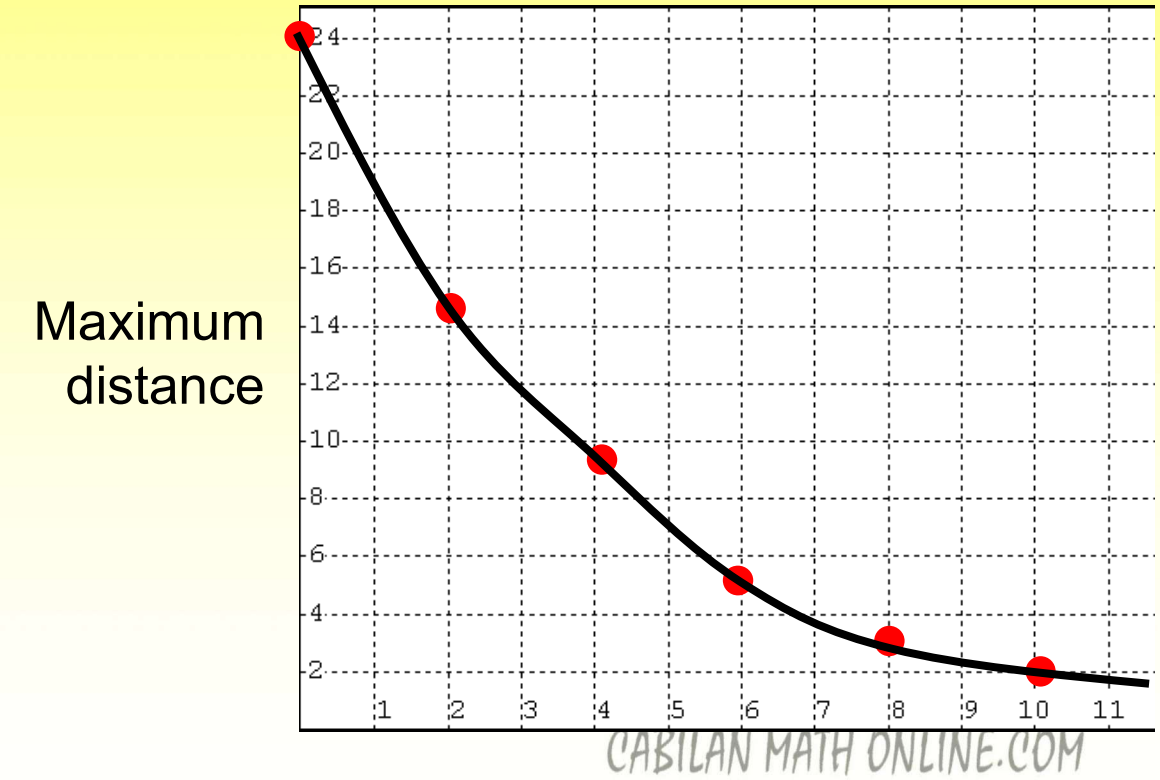
CHAPTER 7.3 INVESTIGATE EXPONENTIAL RELATIONSHIPS

EXAMPLE 2 *Application: Pendulum Motion*

A large pendulum was set in motion. With each complete swing, the pendulum's maximum distance from its rest position decreased. A motion sensor was used to obtain the data after every 2 swings.

(c) Is this relationship an example of **exponential growth** or **exponential decay**? How do you know?

The relationship is an example of **exponential decay**
→ Graph <u>decreases</u> to the right



CHAPTER 7.3 INVESTIGATE EXPONENTIAL RELATIONSHIPS

Homework

Page 377 – 381

#1 – 11