

6 Find the rule of the exponential function in the form $y = ac^x$ that is represented in the following table of values.

x	-2	0	1	2
y	$\frac{4}{3}$	12	36	108

My Calculations

$$y = 12(3)^x$$

7 Perdita is an environmental researcher; she is conducting a study on a new type of eco-friendly plastic. She is taking samples that have an initial mass of 324 grams and has concluded that they decompose to half of their mass every month. Find the rule in the form $y = ac^x$ that is represented in this word problem where x represents time in months and y represents the size of the sample in grams.

My Calculations

$$y = 324\left(\frac{1}{2}\right)^x$$

8 Fish off the coast of South Africa have contracted and are spreading a new type of disease called "Blue Gills" disease that decreases the amount of oxygen they are able to move through their gills. In 2008 researchers found that there were 6 fish that had the disease and that this amount was doubling at a rate of once per year. Find the function rule in the form $y = ac^x$ that is represented in this word problem where x represents time in years and y represents the number of fish with Blue Gills disease.

My Calculations

$$y = 6(2)^x$$

4 The Exponential Function (parameter a) **EVALUATED**



Skill Builder

- 1** State the y -intercept and explain its meaning given the function below.

$$f(x) = 4.2(0.5)^x$$

$\left\{ \begin{array}{l} x: \text{represents time in years} \\ f(x): \text{represents the weight of the substance in grams} \end{array} \right.$

4.2, the weight before any time has passed

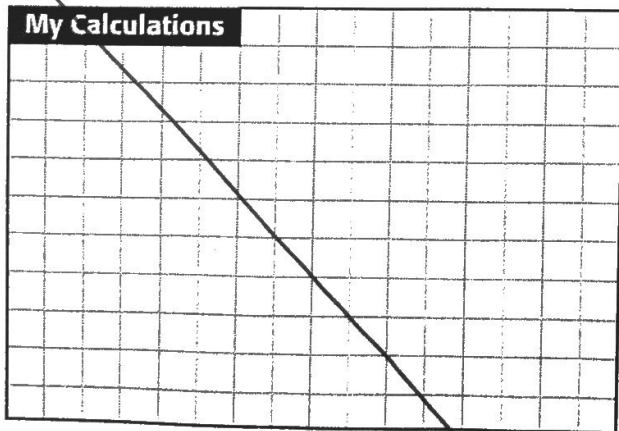
- 2** State the y -intercept and explain its meaning given the function below.

$$f(x) = 10000(1.08)^x$$

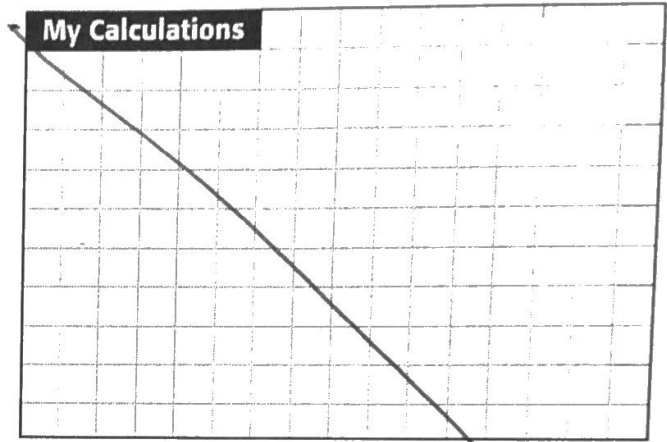
$\left\{ \begin{array}{l} x: \text{represents time in years} \\ f(x): \text{represents the value in dollars} \end{array} \right.$

10 000 the value before any time has passed

- 3** Sketch the graph of the function $y = 6(3)^x$ by making a table of values.

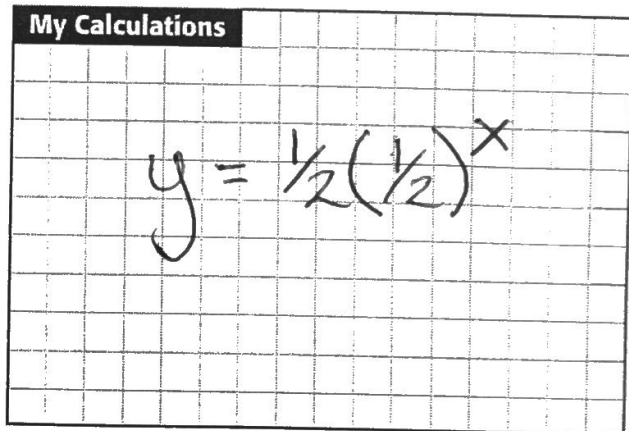


- 4** Sketch the graph of the function $y = 20\left(\frac{1}{2}\right)^x$ by making a table of values.

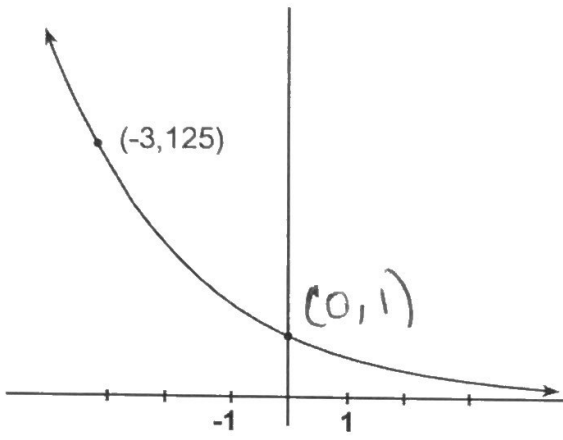


- 5** Find the rule of the exponential function in the form $y = ac^x$ that is represented in the following table of values.

x	-2	0	2
y	2	$\frac{1}{2}$	$\frac{1}{8}$



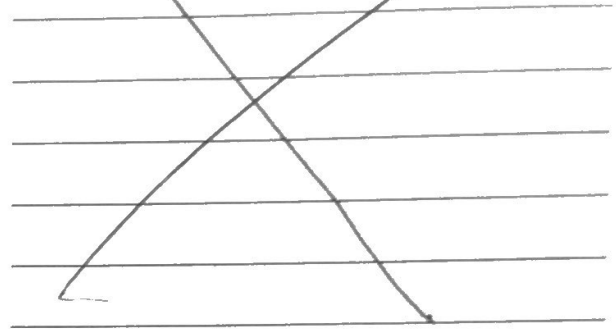
- 9** Find the rule of the exponential function $y = c^x$ represented in the following graph



My Calculations

$$y = \left(\frac{1}{5}\right)^x$$

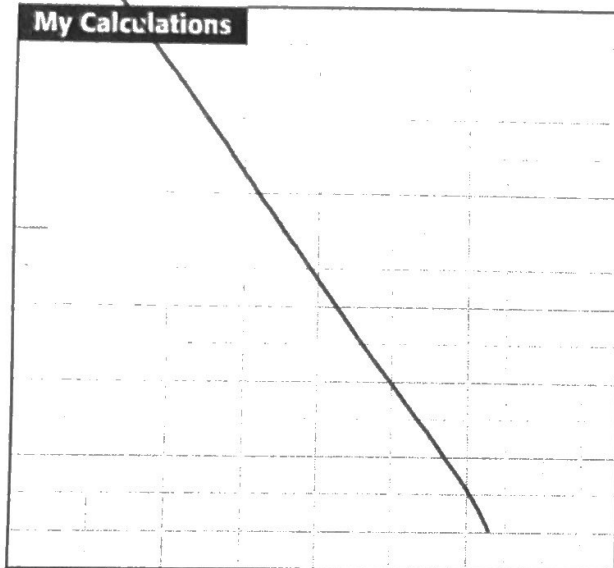
- 10** Formulate a conjecture as to how the value of " c " and the sign of " x " in the basic exponential function $y = c^x$ affect the shape of the curve.



Skill Builder

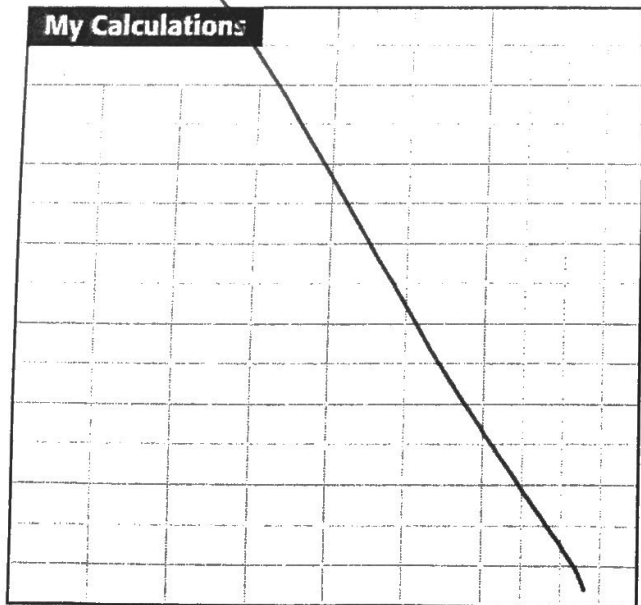
- 6 Sketch the following function by making a table of values (use a calculator if necessary)

$$y = 3^x$$

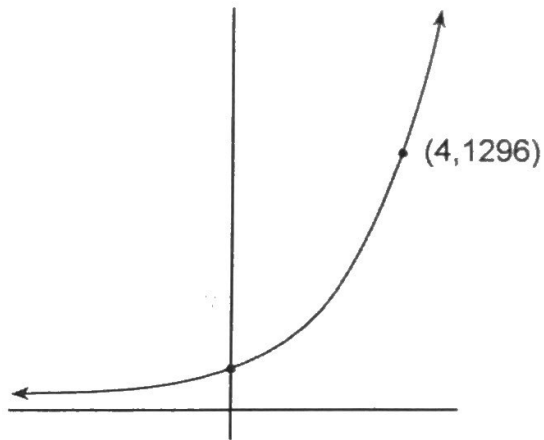


- 7 Sketch the following function by making a table of values (use a calculator if necessary)

$$y = \left(\frac{1}{3}\right)^x$$

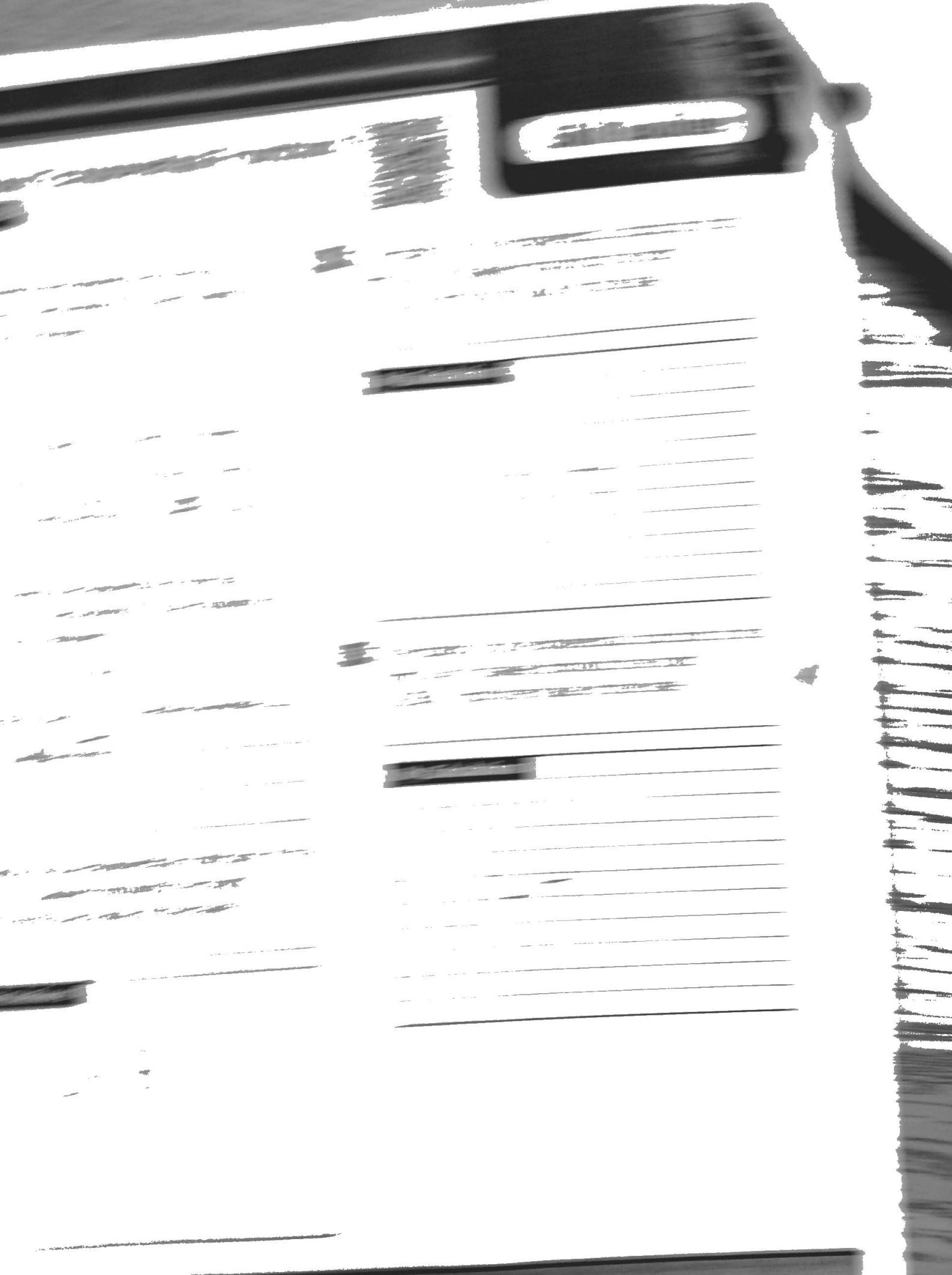


- 8 Find the rule of the exponential function $y = c^x$ represented in the following graph



My Calculations

$$y = 6^x$$



Math CST 4 EXPONENTIAL
FUNCTION

Goal:

- calculate values that are depreciating and appreciating in an exponential function
- find the rule of an exponential function from a graph.

Formula

$$y = \text{start} \times \text{keep}^{\text{time}}$$

Exponent Length of time

number you start with

Amount you are keeping

1 + % (if its increasing)
1 - % (if its decreasing)

Remember BEDMAS

Do the EXPONENT 1st

When the value of y is INCREASING

Words that mean it is increasing: increasing, growing, appreciating, appreciation, interest

Example:

St Hubert has a population of 50000 people. If the population is increasing a rate of 2% per year, how many people will there be in 5 years.

Start: 50 000 Keep: 1.02 Time: 5

$$y = \text{start} \times \text{keep}^{\text{time}}$$
$$y = \underline{50\,000} \times \underline{1.02}^{\boxed{5}}$$

Example:

My PK Subban rookie card cost \$50 brand new. How much will it be worth in 8 years if its value depreciates by 15% every year?

Start: 50 Keep: 0.85 Time: 8

$$y = \text{start} \times \text{keep}^{\text{time}}$$
$$y = \underline{50} \times \underline{0.85}^{\boxed{8}}$$

Example:

A bacteria triples every hour. If there were 25 bacteria to begin with, how many bacterial will there be in 2 days.

Start: 25 Keep: 3 Time: 48

y = start x keep ^{time}

$$y = \underline{25} \times \underline{3}^{\boxed{48}}$$

When the value of y is DECREASING

Words that mean it is decreasing: depreciation, decreasing

My Porsche cost \$112000 brand new. How much will it be worth in 8 years if its value depreciates by 15% every year?

Start: 112 000 Keep: 0.85 Time: 8

y = start x keep ^{time}

$$y = \underline{112000} \times \underline{0.85}^{\boxed{8}}$$

Exponential Functions

1) Which of the exponential functions below show growth and which show decay?

a) $y = 5(0.7)^x$

decrease

b) $y = 10(1.5)^x$

increase

c) $y = 10(1 + 0.12)^x$

increase

2) The population of the city of Appleville, y , is decreasing according to the mathematical model $y = 120,500(.82)^x$, where x is the number of years. (Round all answers to the nearest whole number.)

a) What is the starting population of Appleville? 120 500

b) What would the population be in 10 years, if this trend continues? 16 562

c) Use this model to predict about when the population of Appleville will be about 100 people. ~~100~~ 35.74

3) A population of 2000 bacteria is growing at a rate of 15% each day.

a) Write an equation that expresses the number of bacteria at time x . $y = 2000(1.15)^x$

b) About how many bacteria will there be in 10 days? (Round to nearest whole number.)

8091.12

4) Your new car cost \$25,000 but it depreciates in value by about 16% each year.

a) Write an equation that would indicate the value of the car at x years.

$$y = 25000(0.84)^x$$

b) How much will your car be worth in 5 years? (Round to the nearest cent.)

10 455.30

c) About how long will it take before your car is worth close to \$1000 dollars, according to your equation? Show your work and/or explain how you arrived at an answer.

18.46

5) You invest \$100,000 in an account with 1.04% interest, compounded yearly.

a) Write an equation that gives the amount of money, y , in the account after x years.

$$y = 100000(1.04)^x$$

b) How much money will you have in the account after 10 years?

148 024.42

6) You invest \$30,000 in an account with 2% interest, compounded monthly.

a) Write an equation that gives the amount of money, y , in the account after x years.

$$y = 30000(1.02)^x$$

b) How much money will you have in the account after 3 years?

61196.62

7) Which would be a better deal? You invest \$1,000,000 in an account with 2% interest that compounds interest annually or you invest in an account with 1.8% compounded daily? Explain your answer and show work to support your answer. (hint, what would you have in 1 year? 2 Years?) 1.8% compounded daily

Extra challenge:

After an oven is turned on, its temperature, T , is represented by the equation $T = 400 - 350(3.2)^{-0.1m}$, where m represents the number of minutes after the oven is turned on and T represents the temperature of the oven, in degrees Fahrenheit.

a) What is the temperature of the oven after 5 minutes? (Round to the nearest degree.)

595.7

b) About how many minutes does it take for the oven's temperature to reach 300°F? Show your work and/or explain how you arrived at an answer.

10.77