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QUESTION 1



Select the correct answers that apply.

To find the exponential function of the form

$$f(x) = a b^x$$

, where

b

is positive, passing through the points

$(1, -6)$

and

$(-1, -\frac{2}{3})$

, Rasha does the following calculation:

$$f(1) = a b^1 = -6$$

, and

$$f(-1) = a b^{-1} = -\frac{2}{3}$$

.

That is,

$$a b = -6$$

, and

$$a b^{-1} = -\frac{2}{3}$$

.

Now,

$$\frac{a b}{a b^{-1}} = \frac{-6}{-\frac{2}{3}}$$

$$b = 9$$

Thus,

$$a = \frac{-6}{b} = \frac{-6}{9} = -\frac{2}{3}$$

.

Rasha's work has an error. Select the option that shows the error, and then choose the correct function for $f(x)$

☐

The correct function is

$f(x) = 2(3^x)$

.

☐

She incorrectly substituted the coordinates of the two points in the function.

☐

The correct function is

$f(x) = -3(2^x)$

.

☒

She made a mistake while solving for b .

☐

Her answer is wrong since

a

cannot be negative.

☒

The correct function is

$f(x) = -2(3^x)$

.

QUESTION 2



Select the correct answers that apply.

Farid records the percent area covered by a type of mold on a piece of bread. The given table shows his results, rounded to one decimal place.

Day	1	2	3	4

% covered by mold	8.2	13.6	22.4	36.1
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Choose the correct choices that apply to this data set. Use a graphing tool to check the semi-log graph.

☐ $f(x) = 5e^{2x}$

☐ $f(x) = 50e^{3x}$

☐ The data is best represented by a polynomial since the semi-log graph is similar to a logarithmic curve.

☐ The data is best represented by a polynomial since the semi-log graph is similar to a straight line.

☒ The data is best represented exponentially since the semi-log graph is similar to a line.

☐ $f(x) = e^5 \cdot e^{\frac{x}{2}}$

☒ $f(x) = 5e^{\frac{1}{2}x}$

is the function that represents the given data.

☐ The data is best represented exponentially since the semi-log graph is similar to a curve.

QUESTION 3



Fill in the blank with the correct answer.

Ahmed wants to find a relation between

$$\cosh^2(x)$$

and

$$\sinh^2(x)$$

. After working on it for sometime, he got the relation

$$\cosh^2(x) = \sinh^2(x)$$

. His teacher, however, said it was **not the correct** relation.

Use the definitions of each of

$$\cosh(x)$$

and

$$\sinh(x)$$

, and follow the necessary steps to help Ahmed get the correct relation.

$$\cosh^2(x)$$

=

$$\sinh^2(x)$$

+

1



QUESTION 4



Choose the correct answer.

Given that

$$\cosh(2x) = 25$$

and

$$\sinh(2x) = 24$$

, what is the value of

x

?



e^7



1



$\ln(7)$



7

QUESTION 5



Fill in the blanks with the correct answer.

Semi-log graphs help determine whether a set of data is best represented exponentially  or polynomially.

If a set of data is best represented polynomially (with degree $\geq$

1), the semi-log graph will look more like a logarithmic  graph.

hyperbolic

parabolic

as a linear function

as a rational function

QUESTION 6



Drag and drop the correct answer into the blanks.

If a set of data is best represented exponentially, its semi-log graph will look like a

straight line 

. Similarly, its equation that represents the set of data will be in the form

$f(x) = ae^{bx}$ 

, where

$b = \text{slope of the semi-log graph}$ , and

$\ln a = y$ - intercept of the semi-log graph

$b = \text{slope of the graph}$

$f(x) = be^{ax}$

logarithmic graph

$$f(x) = -ae^{bx}$$

$$b = x - \text{intercept}$$

parabola

QUESTION 7



Fill in the blanks with the correct answer.

The domain of

$$f(x) =$$

$$\sinh(x)$$



is

$$(-\infty, \infty)$$



, and its range is

$$(-\infty, \infty)$$

.

$$[-1, \infty)$$

$$(1, \infty)$$

$$\cosh(x)$$

$$[1, \infty)$$

QUESTION 8



Fill in the blank with the correct answer.

Evaluate

$$f(1)$$

for

$$f(x) = \cosh(x)$$

. Round your answer to the nearest hundredth.

$$f(1) \approx$$

$$1.54$$



QUESTION 9



Fill in the blank with the correct answer.

Evaluate

$$g(x) = \sinh(x)$$

for

$$x = -1$$

. Round your answer to the nearest thousandth.

$$g(-1) \approx$$

-1.175



QUESTION 10



Select the correct answer from the drop-down menu.

The hyperbolic sine function is defined as:

$$\sinh(x) =$$

$$\frac{e^x - e^{-x}}{2}$$



QUESTION 11



Choose the correct answer.

Which one of the following options represents a hyperbolic cosine function?



$$\cosh(x) = \frac{e^x + e^{-x}}{2}$$



☐ $\cosh(x) = \frac{-e^x + e^{-x}}{2}$

☐ $\cosh(x) = -\frac{e^x + e^{-x}}{2}$

☐ $\cosh(x) = \frac{e^x - e^{-x}}{2}$

QUESTION 12



Fill in the blanks with the correct answer.

The table below shows the population of a type of bear recorded over the years.

t (no. of years after 2000 A.D.)	5	10	15
$P(t)$	28	786	22,026

Complete the table below, which you can use to sketch the semi-log graph of the given data. Round your answer to the nearest integer.

t (no. of years after 2000 A.D.)	5
$\ln P(t)$	3 ✓

Using the given data and a graphing utility, the data can be represented exponentially ☒

So,
 $P(t)$

has the form

$$ae^{bt}$$

, where b is the ☒ slope ☒ of the semi-log graph.

x-intercept

y
-intercept

8

5

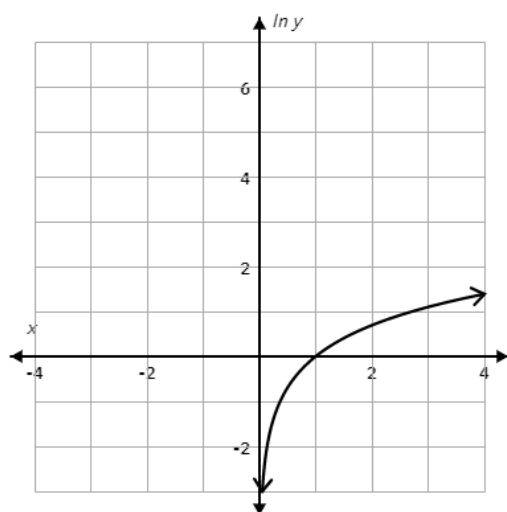
polynomially

QUESTION 13

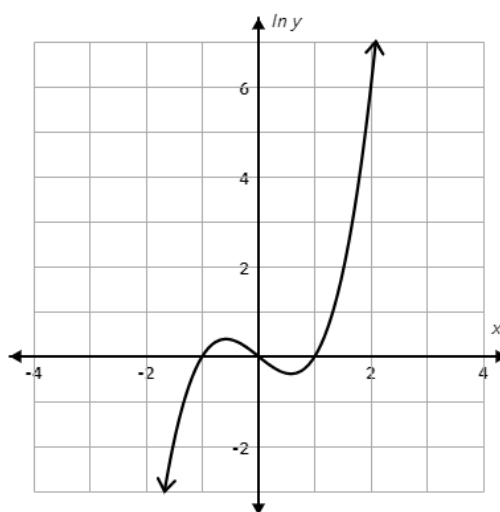


Drag and drop the correct answer into the blank.

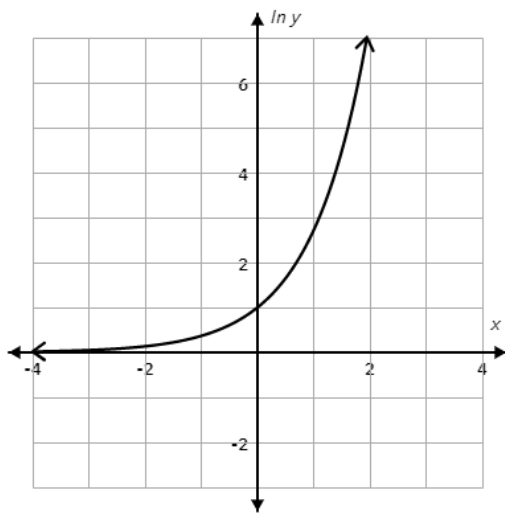
Which of the following is the semi-log graph of an exponential function?



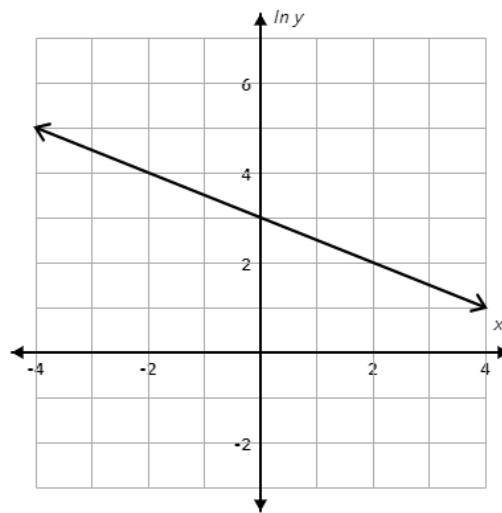
Graph A



Graph B



Graph C



Graph D

Among these, graph is the semi-log graph of an exponential function.

B

A

C

QUESTION 14

Choose the correct answer.

A semi-log graph for data that shows the bacterial growth in fungi is represented by the equation $\ln y = -3x + 7$.

Select the function that represents the bacterial growth in fungi.

☐

It is a polynomial function given by

$$f(x) = 3x^7$$

☐

It is a polynomial function given by

$$f(x) = 7x^3$$



It is an exponential function given by

$$f(x) = -3e^{7x}$$



It is an exponential function given by

$$f(x) = e^7 e^{-3x}$$



QUESTION 15



Select the correct answer from the drop-down menus.

A microbiologist was comparing the growth rate of two types of bacteria, A and B , over a 24-hour period. She found that bacterium A had a growth function modeled by

$$f(t) = e^{15} e^{2.1t}$$

, where

t

is in hours, while the bacterium B data made a semi-log graph of equation

$$\ln y = 3.3t + 15.$$

She compared the initial count of both bacteria A and B at time

$$t = 0$$

and concluded that the initial count of A was identical to B ✓ ▼.

At the end of the 24-hour period, bacteria B ✓ ▼ had the largest growth.