LESSON MAKER PRO

Growth in Motion

Explore exact values and changes in exponential models.

HIGH SCHOOL · PC.NQ.A.1.a

PC.NQ.A.1.a "Explore the behavior of the function $y=e^x$ and its applications."

NAME _____ DATE _____

HOW E CHANGES

In $y=Ae^x$, increasing x by 1 multiplies the output by e, a constant greater than 1. For a negative integer exponent, use a reciprocal: $e^{-n}=1/e^n$.

WORKED EXAMPLE

Evaluate $y=13e^x$ when $x=-6$.

1. Substitute -6 for x: $y=13e^{-6}$.
2. Rewrite the negative exponent: $e^{-6}=1/e^6$.
3. Multiply: $y=13/e^6$.

Answer: $13/e^6$

PRACTICE 6 problems

1 Evaluate $y=e^x$ when $x=2$.

ANSWER _____

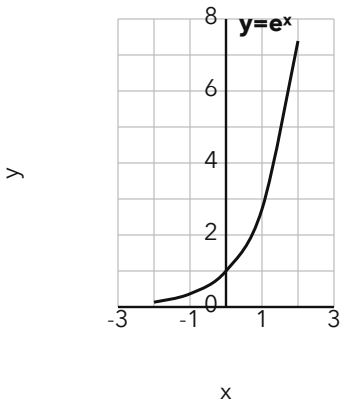
2 Evaluate $y=5e^x$ when $x=-1$.

ANSWER _____

3 Evaluate $y=2e^x$ when $x=0$.

ANSWER _____

4 Use the graph of $y=e^x$. Give its y-intercept as an ordered pair.



ANSWER _____

5 If $e^x=e^3$, what is x?

ANSWER _____

6 For $y=e^x$, what factor multiplies y as x changes from -2 to 1? Show how you found it.

ANSWER _____

APPLY IT Show your work

1 A new song has 50 plays when it is posted. A model for its play count after t days is $P(t)=50e^{t/2}$. Find the exact predicted play count after 2 days. By what factor has it changed?

WORK SPACE

ANSWER _____

2 A phone starts at 80% charge. Its modeled charge after t hours is $B(t)=80e^{-t/5}$ percent. Find the exact percent charge after 5 hours. What fraction of the starting charge remains?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Two apps have active-user indexes $A(t)=4e^{t}$ and $B(t)=4e^{-t}$. At t=2, find the exact ratio A(2)/B(2). Explain which index is larger.

WORK SPACE AND ANSWER

Growth in Motion

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Evaluate $y=e^x$ when $x=2$.	**e^2**
2	Evaluate $y=5e^x$ when $x=-1$.	**$5/e$**
3	Evaluate $y=2e^x$ when $x=0$.	**2**
4	Use the graph of $y=e^x$. Give its y-intercept as an ordered pair.	**(0, 1)**
5	If $e^x=e^3$, what is x?	**3**
6	For $y=e^x$, what factor multiplies y as x changes from -2 to 1? Show how you found it.	**The factor is e^3, because $e^1/e^{-2}=e^3$.**

PART 2 · APPLY IT

1. **50e plays; a factor of e** Substitute t=2 to get $P(2)=50e^1=50e$. Divide by the initial 50 plays to get a factor of e.
2. **80/e%; 1/e of the starting charge** Substitute t=5 to get $B(5)=80e^{-1}=80/e$ percent. Dividing by the starting 80% gives 1/e.

CHALLENGE

$A(2)/B(2)=(4e^2)/(4e^{-2})=e^4$. A(2) is larger because $e^4>1$.

Accept equivalent exact forms, including $5e^{-1}$ for 5/e. Decimal approximations are not needed.