Name _____ Date _____ Class _____

LESSON 7-6

Practice A

The Natural Base, *e*

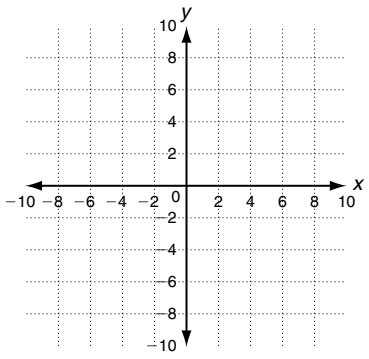
Graph each exponential function.

1. $f(x) = e^{-x}$

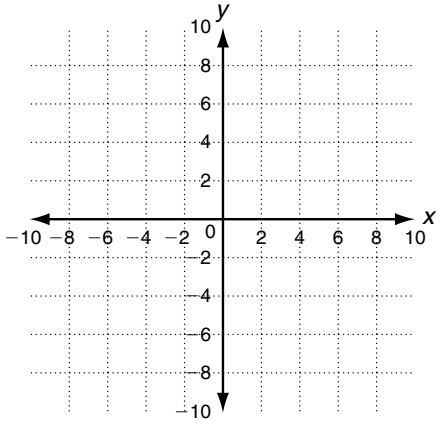
a. Complete the table.

x	−2	−1	0	1	2	3
$f(x)$	7.4					

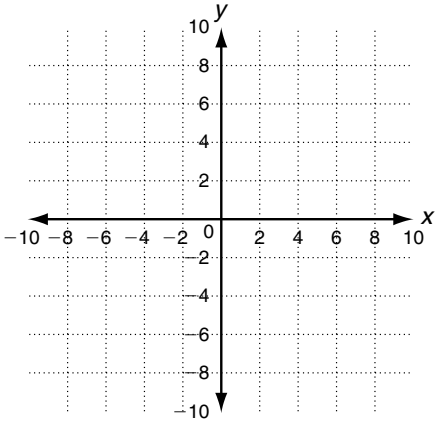
b. Graph the ordered pairs and draw a curve through the points.



2. $f(x) = 2 - e^{x}$



3. $f(x) = e^{2-x}$



Simplify.

4. $\ln e^{7x}$

5. $\ln e^{x+4}$

6. $e^{\ln x}$

7. $e^{3 \ln x}$

8. $e^{5 \ln (x+1)}$

9. $\ln e^{x-1}$

10. $x \cdot \ln e^{3}$

11. $e^{-1 \cdot \ln 5x}$

12. $2 \ln e^{x}$

Solve.

13. Use the formula $A = Pe^{rt}$ to find the total amount of an investment of $5000 at 6% interest compounded continuously for 8 years.

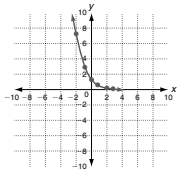
LESSON 7-6

Practice A

The Natural Base, *e*

Graph each exponential function.

1. $f(x) = e^{-x}$

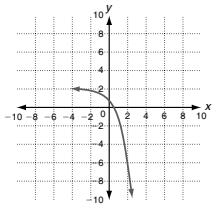


a. Complete the table.

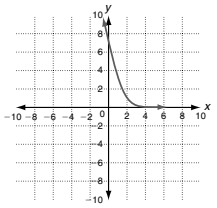
x	−2	−1	0	1	2	3
$f(x)$	7.4	2.7	1	0.37	0.14	0.05

b. Graph the ordered pairs and draw a curve through the points.

2. $f(x) = 2 - e^{x}$



3. $f(x) = e^{2-x}$



Simplify.

4. $\ln e^{7x}$

$7x$

5. $\ln e^{x+4}$

$x + 4$

6. $e^{\ln x}$

x

7. $e^{3 \ln x}$

x^3

8. $e^{5 \ln (x+1)}$

$(x+1)^5$

9. $\ln e^{x-1}$

$x - 1$

10. $x \cdot \ln e^{3}$

$3x$

11. $e^{-1 \cdot \ln 5x}$

$(5x)^{-1}$, or $\frac{1}{5x}$

12. $2 \ln e^{x}$

$2x$

Solve.

13. Use the formula $A = Pe^{rt}$ to find the total amount of an investment of $5000 at 6% interest compounded continuously for 8 years.

$8080.37

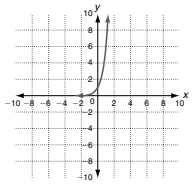
LESSON 7-6

Practice B

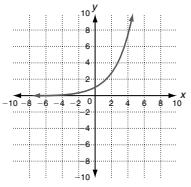
The Natural Base, *e*

Graph.

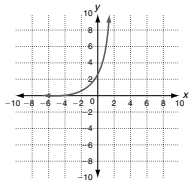
1. $f(x) = e^{2x}$



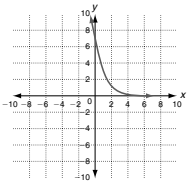
2. $f(x) = e^{0.5x}$



3. $f(x) = e^{1+x}$



4. $f(x) = e^{2-x}$



Simplify.

5. $\ln e^{x+2}$

$x + 2$

6. $e^{\ln 2x}$

$2x$

7. $e^{7 \ln x}$

x^7

8. $\ln e^{3x+1}$

$3x + 1$

9. $\ln e$

1

10. $\ln e^{2x+y}$

$2x + y$

Solve.

11. Use the formula $A = Pe^{rt}$ to compute the total amount for an investment of $4500 at 5% interest compounded continuously for 6 years.

$6074.36

12. Use the natural decay function, $N(t) = N_0 e^{-kt}$, to find the decay constant for a substance that has a half-life of 1000 years.

0.000693

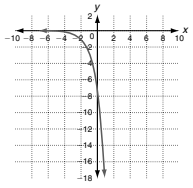
LESSON 7-6

Practice C

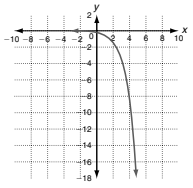
The Natural Base, *e*

Graph.

1. $f(x) = -e^{x+2}$



2. $f(x) = -e^{x-2}$



Simplify.

3. $\ln e^{5x-3}$

$5x - 3$

4. $\ln e^{2 \ln 8x}$

$8x^2$

5. $e^{4 \ln (x-2)}$

$(x-2)^4$

6. $e^{-\ln 4 - x}$

$(4 - x)^{-1}$, or $\frac{1}{4-x}$

7. $\ln e^{\sqrt{x}}$

$\sqrt{x}$

8. $\ln e^{\frac{4}{x}}$

$\frac{4}{x}$

Solve.

9. Ariana has a choice of two investments. She can invest $12,000 at 5% for 8 years, or she can invest $9000 at 6.5% for 7 years. Both accounts are compounded continuously. Which investment will result in the greater amount of interest earned?

The investment of $12,000 will earn $5901.90 in interest; the investment of $9000 will earn $5185.56 in interest. The first investment will earn more interest.

10. Use the natural decay function, $N(t) = N_0 e^{-kt}$, to find the age of a fossil containing 35% of the original amount of a particular substance. This substance has a half-life of 2450 years.

a. Find the decay constant.

0.000283

b. Find the age of the fossil.

3710 years

LESSON 7-6

Reteach

The Natural Base, e

The **natural logarithmic function**, $f(x) = \ln x$, is the inverse of the exponential function with the natural base e, $f(x) = e^{x}$.

The constant e is an irrational number. $e \approx 2.71828\ldots$.

Properties of logarithms apply to the natural logarithm.

In particular:

$\ln 1 = 0$	The base is e and $e^0 = 1$.
$\ln e = 1$	Think: $e^1 = e$.
$\ln e^x = x$ $e^{\ln x} = x$	The natural logarithm and the exponential function are inverses, so they undo each other.

Use properties of logarithms to simplify expressions with e or "ln."

Simplify: $\ln e^{x+2}$

Step 1 Use the Power Property. "Bring down" the exponent to multiply.

$\ln e^{x+2}$

$(x+2) \ln e$

$\ln e = 1$

Step 2 Simplify.

$(x+2) \ln e$

$x + 2$

Simplify: $e^{4 \ln x}$

Step 1 Use the Power Property. Write the exponent.

$e^{4 \ln x}$

$e^{\ln x^4}$

$e^{\ln x} = x$

Step 2 Simplify.

$e^{\ln x^4}$

x^4

Simplify each expression.

1. $\ln e^{-6x}$

$-6x \ln e$

$-6x$

2. $\ln e^{t-3}$

$(t-3) \ln e$

$t - 3$

3. $e^{2 \ln x}$

$e^{\ln x^2}$

x^2

4. $\ln e^{1.8}$

$1.8 \ln e$

1.8

5. $\ln e^{x+1}$

$(x+1) \ln e$

$x + 1$

6. $e^{7 \ln x}$

$e^{\ln x^7}$

x^7