7.3 Use Functions Involving *e*

Special Numbers:

euler

$\pi =$ 3.141592.... $i =$ $\sqrt{-1}$

n	*1*	*10*	*100*	*1,000*	*10,000*	*100,000*	*1,000,000*
$\left(1+\frac{1}{n}\right)^n$	2	2.594...	2.705...	2.717...	2.718...	2.718...	2.718...

$\left(1+\frac{1}{1}\right)^1$ $\left(1+\frac{1}{10}\right)^{10}$ $\left(1+\frac{1}{100}\right)^{100}$

$\left(1+\frac{1}{\infty}\right)^{\infty} \to e =$ 2.7182818284...

EXAMPLE 1 Simplify natural base expressions

Simplify the expression.

a. $e^2 \cdot e^5$

e^{2+5}

e^7

b. $\frac{12e^4}{3e^3}$

$4e^{4-3}$

$4e^1$

$4e$

c. $(5e^{-3x})^2$

$5^2 e^{(-3x)(2)}$

$25e^{-6x}$

$\frac{25}{e^{6x}}$

EXAMPLE 2 **Evaluate natural base expressions**

ln button

Use a calculator to evaluate the expression.

a. e^4

e^x 4 = 54.598

$e^{\wedge}$ 4 = 54.598

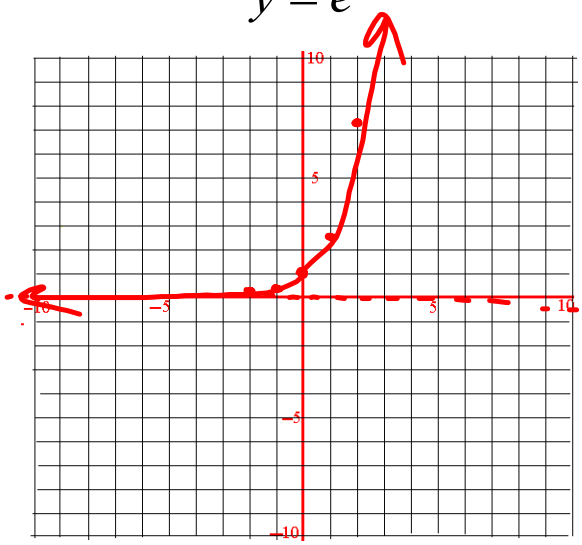
e ^ 4 = 54.598

b. $e^{-0.09}$

0.914

Graphs involving e

$y = e^x$



x	y
-2	0.135
-1	0.368
0	1
1	2.718
2	7.389

$\left(\frac{1}{e}\right)^x$

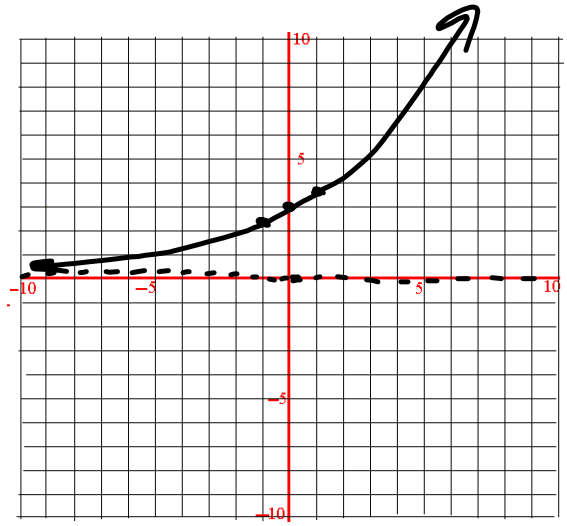
$y = e^{-x}$

x	y
-2	7.389
-1	2.718
0	1
1	0.368
2	0.135

EXAMPLE 3 Graph natural base functions

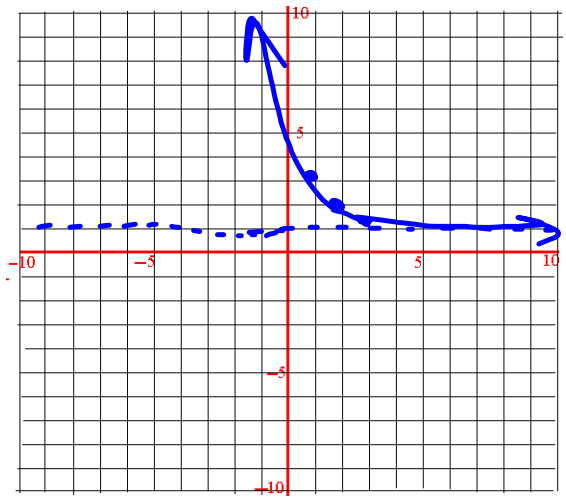
Graph the function. State the domain and range.

a. $y = 3e^{0.25x}$



x	y
−1	2.336
0	3
1	3.852

b. $y = e^{-0.75(x-2)} + 1$



x	y
1	3.117
2	2
3	1.472

Compound Interest Formula

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

$$\left(1 + \frac{1}{n}\right)^{n} = e \quad (n \to \infty)$$

Continuously Compounded Interest Formula

$$A = Pe^{rt}$$

EXAMPLE 5 Model continuously compounded interest

FINANCE You deposit $4000 in an account that pays 6% annual interest compounded continuously. What is the balance after 1 year?

$A = Pe^{rt}$

$A = 4000e^{0.06(1)}$

$= \$4247.39$

Q → 4245.45