Simplify the expression.

1. $e^7 \cdot e^4$ **2.** $2e^{-3} \cdot 6e^5$ **3.** $\dfrac{24e^8}{4e^5}$ **4.** $(10e^{-4x})^3$
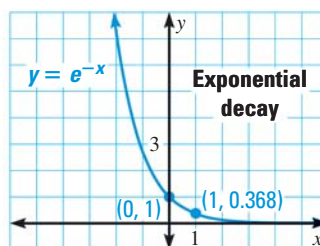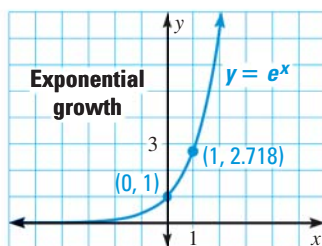
5. Use a calculator to evaluate $e^{3/4}$.

KEY CONCEPT   *For Your Notebook*

Natural Base Functions

A function of the form $y = ae^{rx}$ is called a *natural base exponential function*.

• If $a > 0$ and $r > 0$, the function is an exponential growth function.

• If $a > 0$ and $r < 0$, the function is an exponential decay function.

The graphs of the basic functions $y = e^x$ and $y = e^{-x}$ are shown below.

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EXAMPLE 3   **Graph natural base functions**

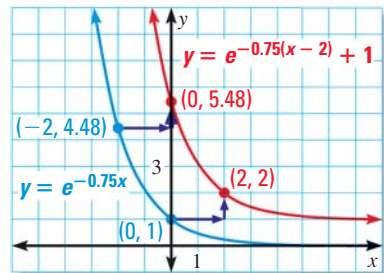**Graph the function. State the domain and range.**

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

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

Solution

ANOTHER WAY

You can also write the function from part (a) in the form $y = ab^x$ in order to graph it:

$y = 3e^{0.25x}$
$y = 3(e^{0.25})^x$
$y \approx 3(1.28)^x$

a. Because $a = 3$ is positive and $r = 0.25$ is positive, the function is an exponential growth function. Plot the points $(0, 3)$ and $(1, 3.85)$ and draw the curve.
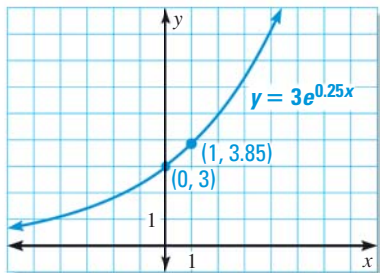
The domain is all real numbers, and the range is $y > 0$.

b. $a = 1$ is positive and $r = -0.75$ is negative, so the function is an exponential decay function. Translate the graph of $y = e^{-0.75x}$ right 2 units and up 1 unit.

The domain is all real numbers, and the range is $y > 1$.