Algebra II: 7.3 Notes
Date:

Name:
Period:

Objective: Study functions involving the natural e.

The history of mathematics is marked by the discovery of special numbers such as π and i. Another special number is denoted by the letter e. The number is called the **natural base e** or the *Euler number* after its discoverer, Leonhard Euler (1707–1783). The expression $\left(1+\frac{1}{n}\right)^n$ approaches e as n increases.

n	10^1	10^2	10^3	10^4	10^5	10^6
$\left(1+\frac{1}{n}\right)^n$	2.59374	2.70481	2.71692	2.71815	2.71827	2.71828

KEY CONCEPT

The Natural Base e

The natural base e is irrational. It is defined as follows:

As n approaches $+\infty$, $\left(1+\frac{1}{n}\right)^n$ approaches $e \approx 2.718281828$.

Simplify the expression.

1. $e^2 \bullet e^5$ $= e^7$

2. $e^7 \bullet e^4$ $= e^{11}$

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

4. $\frac{24e^8}{4e^5}$ $= 6e^3$

5. $(5e^{-3x})^2$ $= 25e^{-6x}$
$= \frac{25}{e^{6x}}$

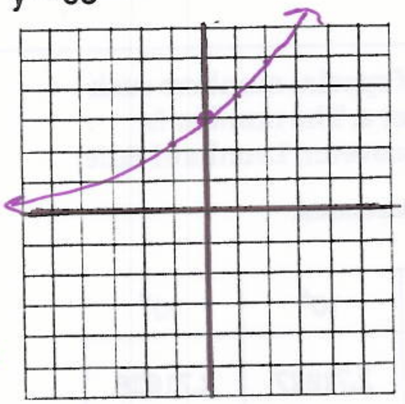
6. $(10e^{-4x})^3$ $= \frac{1000}{e^{12x}}$

7. $2e^{-3} \bullet 6e^5$
$= 12e^2$

8. Use a calculator to evaluate $e^{3/4}$.
≈ 2.117

Graph the function, identify the asymptote, and state the domain and range.

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

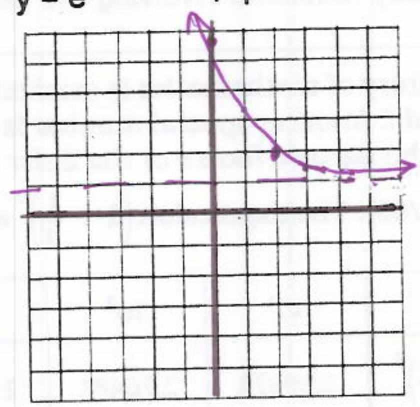


$y=0$

D: $\mathbb{R}$

R: $y>0$

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

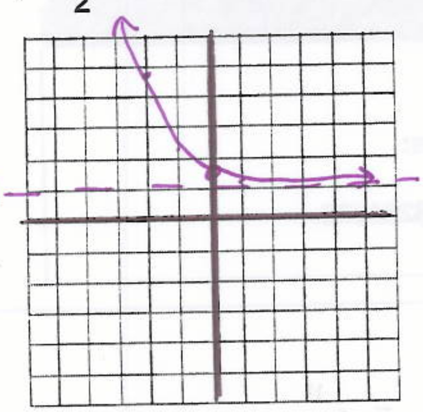


$y=1$

D: $\mathbb{R}$

R: $y>1$

5. $y = \frac{1}{2}e^{-x} + 1$

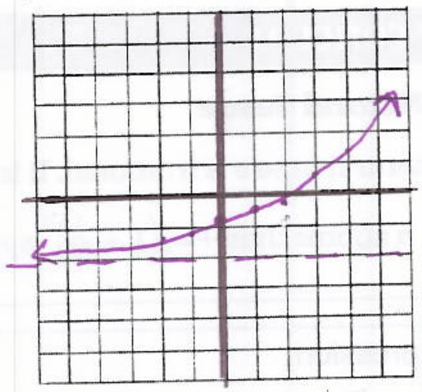


$y=1$

D: $\mathbb{R}$

R: $y>1$

6. $y = 1.5e^{0.25(x-1)} - 2$



$y=-2$

D: $\mathbb{R}$

R: $y>-2$

KEY CONCEPT

Continuously Compounded Interest

When interest is compounded *continuously*, the amount A in an account after t years is given by the formula

$$A = Pe^{rt}$$

where P is the principal and r is the annual interest rate expressed as a decimal.

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

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

$A = \$4247.35$

8. You deposit $2500 in an account that pays 5% annual interest compounded continuously. What is the balance after 2 years? 7.5 years?

$A = 2500e^{0.05(2)} = \$2762.93$

$A = 2500e^{0.05(7.5)} = \$3637.48$