Complete the table to investigate the growth of a $1 investment that earns 100% annual interest over 1 year as the number of compounding periods per year, *n*, increases.

Compounding Schedule	*n*	$P(1+\frac{r}{n})^{nt}$	*Value*
annually			
semiannually			
quarterly			
monthly			
daily			
hourly			
every minute			
every second			

Complete the table to investigate the growth of a $1 investment that earns 100% annual interest over 1 year as the number of compounding periods per year, *n*, increases.

Compounding Schedule	*n*	$P(1+\frac{r}{n})^{nt}$	*Value*
annually	1		2
semiannually	2		2.25
quarterly	4		2.44140625
monthly	12		2.61303529
daily	365		2.714567482
hourly	8760		2.718126691
every minute	525600		2.718279215
every second	3153600		2.718282473

8.3 Part 1 The Number *e*

Although any positive number can be used for the base, the most important base is the number denoted by e.

e is defined as the value that $(1 + \frac{1}{n})^n$ approaches as n becomes large (in calculus, this idea is made more precise).

$e \approx 2.718281828459045235 36...$

This number is called the natural base e, or the Euler number, after its discover, Leonhard Euler (1707-1783).

Examples: Simplify each expression.

1. $e^3 \cdot e^4$

e^7

2. $\frac{10e^3}{5e^2}$

$2e^1$

3. $(3e^{-4x})^2$

$3^2 (e^{-4x})^2$

$9e^{-8x} = \frac{9}{e^{8x}}$

4. $\frac{24e^8}{9e^1}$ (3÷ 3÷)

$\frac{8}{3}e^7$ or $\frac{8e^7}{3}$

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

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

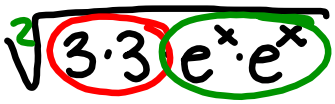
$\frac{e^{15x}}{8}$

6. $e^7 \cdot e^8$

e^{15}

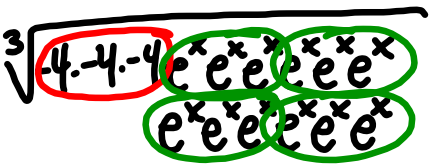
Examples: Simplify each expression.

7. $\sqrt{9e^{2x}}$



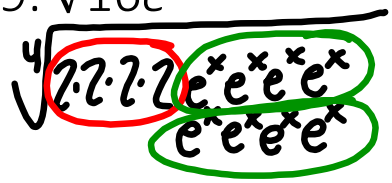
$3e^{x}$

8. $\sqrt[3]{-64e^{12x}}$



$-4e^{4x}$

9. $\sqrt[4]{16e^{8x}}$ $2e^{2x}$



10. $\sqrt[4]{81e^{12x}}$

$3e^{3x}$

11. $\sqrt[3]{49e^{18x}}$

$7e^{9x}$

12. $\sqrt[3]{125e^{21x}}$

$5e^{7x}$

Evaluate to three decimal places.

13. $e^{3} \approx 20.086$

14. $2e^{-.53} \approx 1.177$

15. $e^{4.8} \approx 121.510$

16. $e^{-1/3} \approx 0.717$

17. $-1.8e^{4.2} \approx -120.035$

18. $0.15e^{-6} \approx 0.0004$