9.3 Practice – The Number e Name: Solutions

For 1-8, simplify. Your answer should contain only positive exponents

1. $e^3 \cdot e^{-5}$

   e^{3+-5}

   e^{-2}

   $\boxed{\dfrac{1}{e^2}}$

2. $-\dfrac{e^x}{2e}$

   $-\dfrac{1}{2}e^{x-1}$

   $\boxed{-\dfrac{e^{x-1}}{2}}$

3. $\dfrac{5e^x}{e^{5x}}$

   $5e^{x-5x}$

   $5e^{-4x}$

   $\boxed{\dfrac{5}{e^{4x}}}$

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

   $2^3 e^{-12x}$

   $\boxed{\dfrac{8}{e^{12x}}}$

5. $-2e^{3x} \cdot e^{-4}$

   $\boxed{-2e^{3x-4}}$

6. $\dfrac{e^{2x+7}}{e^{x+3}}$

   $e^{(2x+7)-(x+3)}$

   $\boxed{e^{x+4}}$

7. $\dfrac{e^{x^2-5x+1}}{e^{3x+4}}$

   $e^{(x^2-5x+1)-(3x+4)}$

   $\boxed{e^{x^2-8x-3}}$

8. $(3e^{x-3})^{2x}$

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

   $\boxed{9^x e^{2x^2-6x}}$

9. $-\dfrac{5e^{2x}}{e^{3x}}$

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

   $-5e^{-x}$

   $\boxed{-\dfrac{5}{e^x}}$

10. $\dfrac{e^{6x-1}}{e^{x-2}}$

    $e^{6x-1-(x-2)}$

    $\boxed{e^{5x+1}}$

11. $\dfrac{e^{5x}}{e^3}$

    $\boxed{e^{5x-3}}$

12. $(5e^{2+3x})^2$

    $\boxed{25e^{4+6x}}$

13. $4e^{10x} \cdot e^{-8}$

    $\boxed{4e^{10x-8}}$

14. $(-3e^{6x})^3$

    $\boxed{-27e^{18x}}$

15. $\dfrac{e^{x^2+2x-4}}{e^{5x+4}}$

    $e^{x^2+2x-4-(5x+4)}$

    $\boxed{e^{x^2-3x-8}}$

16. $(-2e^{2x+1})^{3x}$

    $(-2)^{3x}(e^{2x+1})^{3x}$

    $\boxed{-8^x e^{6x^2+3x}}$

For 17-20, use a calculator to evaluate the expression. Round the result to three decimal places.

17. $4e^2$

    29.556

18. $-10e^{-2}$

    -1.353

19. $52e^{-4}$

    0.952

20. $-4e^3$

    -80.342

For 21-24, tell whether the function is an example of exponential growth or exponential decay.

21. $y = 4(e)^{-6x}$

    Decay

22. $y = \frac{1}{7}(e)^{3x}$

    Growth

23. $y = -\frac{1}{4}(e)^{-x}$

    Decay

24. $y = -2(e)^{0.4x}$

    Growth

For 25 – 32, use one of the three generic models to help you create a specific model for each compounding interest scenario. Then, use your model to calculate the balance for the given number of years.

Compounding Interest (continuous compounding)	Compounding Interest (periodic compounding)	% increase/decrease per unit of time
$A = Pe^{rt}$	$A = P\left(1+\dfrac{r}{n}\right)^{nt}$	$f(x) = ab^x$

25. You deposit $800 in an account that pays 5.7% annual interest compounded continuously. How much will you have after 13 years?

$$A(t) = 800e^{0.057t}$$
$$A(13) = \$1,678.43$$

26. Your home is worth $200,000 and increases in value by 2.5% per year. How much will it be worth in 20 years?

$$h(x) = 200,000(1.025)^x$$
$$h(20) = \$327,723.29$$

27. The value of your baseball cards is currently $320 and increase in value by 0.5% every month. How much will the cards be worth in two years?

$$V(m) = 320(1.005)^m$$
$$V(24) = \$360.69$$

28. You deposit $468 into a mutual fund account. It decreases in value by 1% per week for six months. How much do you have after 14 weeks?

$$A(w) = 468(0.99)^w$$
$$A(14) = \$406.57$$

29. You deposit $1000 in an account that pays 2% annual interest compounded quarterly. How much will you have after 8 years?

$$A(t) = 1000\left(1+\frac{0.02}{4}\right)^{4t}$$
$$A(8) = \$1,173.04$$

30. You deposit $3500 in an account that pays 8.2% annual interest compounded continuously. How much will you have after 2 years?

$$A(t) = 3500e^{0.082t}$$
$$A(2) = \$4,123.75$$

31. You deposit $5 in an account that pays 24% annual interest compounded continuously. How much will you have after 50 years?

$$A(t) = 5e^{0.24t}$$
$$A(50) = \$813,773.96$$

32. You deposit $111 and it increases by 2% per year. How much money do you have after 15 years?

$$A(t) = 111(1.02)^t$$
$$A(15) = \$149.39$$

Algebra Skills:

1. Below are graphs of $f(x) = \sqrt{x}$ (thin line) and its translation (bold line). Write an equation of the translation.
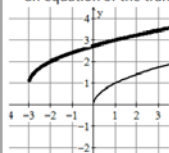
$$f(x) = \sqrt{x+3} + 1$$

Simplify the fraction by rationalizing the denominator.

2. $\dfrac{2}{\sqrt{3}} = \dfrac{2}{\sqrt{3}}\cdot\dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{2\sqrt{3}}{3}$

3. $\dfrac{21}{4\sqrt{7}} = \dfrac{21}{4\sqrt{7}}\cdot\dfrac{\sqrt{7}}{\sqrt{7}} = \dfrac{3\cdot\sqrt{7}}{4\cdot7} = \dfrac{3\sqrt{7}}{4}$

Solve by factoring.

4. $10x^3 - 110x^2 + 280x = 0$
$10x(x^2 - 11x + 28) = 0$
$10x(x-7)(x-4) = 0$
$x=0, \ x=7, \ x=4$

5. $14x^2 - 35x - 21 = 0$
$7(2x^2 - 5x - 3) = 0$
$7(2x+1)(x-3) = 0$
$x = -\frac{1}{2} \text{ or } x=3$

SAT Prep:

1. Simplify: $(2^{x-1})(2^{2-x})^{3x}$

(A) $(2)^{7x-3x^2-1}$
(B) $(2)^{1-3x}$
(C) $(2)^{3x}$
(D) $(2)^{9x^2-3x^3-6x}$

$x-1 + (2-x)(3x)$
$x-1 + 6x - 3x^2$
$7x - 1 - 3x^2$

2. If $f(x) = 3(2)^{x-8} + 1$, find $f(6)$.

$$f(6) = 3(2)^{6-8} + 1$$
$$3(2)^{-2} + 1$$
$$3\left(\frac{1}{4}\right) + 1$$
$$\frac{3}{4} + \frac{4}{4} = \frac{7}{4}$$

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