

Simplify the following expressions:

1. $\frac{1}{13} \frac{e^6}{26e^5}$ $\left(\frac{e}{13}\right)$	2. $(-5e)^3$ $(-125e^3)$
3. $-\frac{52e^3}{4e^9}$ $\left(-\frac{13}{e^6}\right)$	4. $2e^{11} \cdot 5e^6$ $(10e^{17})$

Evaluate the following expression:

5. $\log_{10} 1000 = (3)$	6. $\log_3 81 = (4)$
7. $\ln e^{4x} = (4x)$	8. $\log_2 2^9 = (9)$
9. $\log_3 9^{4x} = (8x)$	10. $\ln e^{-3} = (-3)$

What type of function is: (exponential decay, linear, quadratic, exponential growth)

11. $y = 3e^{5x}$ (growth)	12. $y = 7e^{-2x}$ (decay)
13. $y = 5x - 1$ (linear)	14. $y = x^2 - 5x - 6$ (quadratic)

Log Properties: Condense the following expressions:

15. $\log 5 + \log 11 + \log 2$ $\log(5 \cdot 11 \cdot 2)$ $(\log 110)$	16. $\frac{1}{3} \log_2 27 - 2 \log_2 y + 2 \log_2 z$ $\log_2 27^{\frac{1}{3}} - \log_2 y^2 + \log_2 z^2$ $\log_2 3 - \log_2 y^2 + \log_2 z^2$ $(\log_2 \frac{3z^2}{y^2})$
17. $\frac{1}{2} \log_3 4 - 2 \log_3 x + \frac{1}{3} \log_3 y$ $\log_3 4^{\frac{1}{2}} - \log_3 x^2 + \log_3 y^{\frac{1}{3}}$ $\log_3 2 - \log_3 x^2 + \log_3 y^{\frac{1}{3}}$ $(\log_3 \frac{2y^{\frac{1}{3}}}{x^2})$	18. $\log_3 12 + \log_3 6 - \log_3 2$ $\log_3 \frac{12 \cdot 6}{2} = (\log_3 36)$

Log Properties: Expand the following expressions:

<p>19. $\log_2 \frac{4x^2}{5y^7}$</p> <p>$\log_2 4x^2 - \log_2 5y^7$ $(\log_2 4 + 2\log_2 x) - (\log_2 5 + 7\log_2 y)$ $2 + 2\log_2 x - \log_2 5 - 7\log_2 y$</p>	<p>20. $\log_5 (5x^4y)$</p> <p>$\log_5 5 + 4\log_5 x + \log_5 y$ $1 + 4\log_5 x + \log_5 y$</p>
<p>21. $\log_6 \frac{2xy^3}{z^2}$</p> <p>$\log_6 2 + \log_6 x + 3\log_6 y - 2\log_6 z$</p>	<p>22. $\log_2 (14xy)$</p> <p>$\log_2 14 + \log_2 x + \log_2 y$</p>

Use Change-of-Base Formula to evaluate:

<p>23. $\log_7 776$</p> <p>9.60</p>	<p>24. $\log_5 124$</p> <p>2.995</p>
<p>25. $\log_7 1300$</p> <p>3.68</p>	<p>26. $\log_{15} 23283$</p> <p>3.71</p>

Solve the following equation.

<p>27. $4^x = \left(\frac{1}{2}\right)^{x-3}$</p> <p>$2^{2x} = 2^{-1(x-3)}$ $2x = -x + 3$ $+x \quad +x$ $3x = 3$ $x = 1$</p>	<p>28. $9^{2x} = 27^{x-1}$</p> <p>$3^{2(2x)} = 3^{3(x-1)}$ $4x = 3x - 3$ $-3x \quad -3x$ $x = -3$</p>
<p>29. $100^{7x+1} = 1000^{3x-2}$</p> <p>$10^2(7x+1) = 10^3(3x-2)$ $14x + 2 = 9x - 6$ $-9x - 2 \quad -9x - 2$ $5x = -8$ $\frac{5x}{5} = \frac{-8}{5}$ $x = -\frac{8}{5}$</p>	<p>30. $4^x = 11$</p> <p>$\log_4 4^x = \log_4 11$ $x = \log_4 11$ $x = 1.73$</p>

31. $7^{9x} = 15$

$$\log_7 7^{9x} = \log_7 15$$

$$\frac{9x}{9} = \frac{\log_7 15}{9}$$

$$x \approx .14$$

32. $4e^{-3x} - 7 = 13$

$$\frac{4e^{-3x}}{4} = \frac{20}{4}$$

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

$$\ln e^{-3x} = \ln 5$$

$$\frac{-3x}{-3} = \frac{\ln 5}{-3}$$

$$x \approx -5.36$$

33. $\frac{1}{3} = 27^{2x-3}$

$$3^{-1} = 3^3(2x-3)$$

$$\begin{array}{r} -1 = 6x - 9 \\ +9 \quad +9 \end{array}$$

$$\frac{8}{6} = \frac{6x}{6} \quad x = \frac{4}{3}$$

34. $e^{-56x} = 9$

$$\ln e^{-56x} = \ln 9$$

$$\frac{-56x}{-56} = \frac{\ln 9}{-56}$$

$$x \approx -3.92$$

35. $\log_5(4x-7) = \log_5(x+5)$

$$\begin{array}{r} 4x - 7 = x + 5 \\ -x + 7 \quad -x + 7 \end{array}$$

$$\frac{3x}{3} = \frac{12}{3} \quad x = 4$$

36. $\log_4(5x-1) = 3$

$$\begin{array}{r} 5x - 1 = 64 \\ +1 \quad +1 \end{array}$$

$$5x = 65$$

$$x = 13$$

37. $\ln(7x-4) = \ln(2x+11)$

$$\begin{array}{r} 7x - 4 = 2x + 11 \\ -2x + 4 \quad -2x + 4 \end{array}$$

$$5x = 15$$

$$x = 3$$

38. $\log 5x + \log(x-1) = 2$

$$\log(5x(x-1)) = 2$$

$$\log 5x^2 - 5x = 2$$

$$5x^2 - 5x = 100$$

$$-100 \quad -100$$

$$5x^2 - 5x - 100 = 0$$

$$\frac{5(x^2 - x - 20)}{5} = 0$$

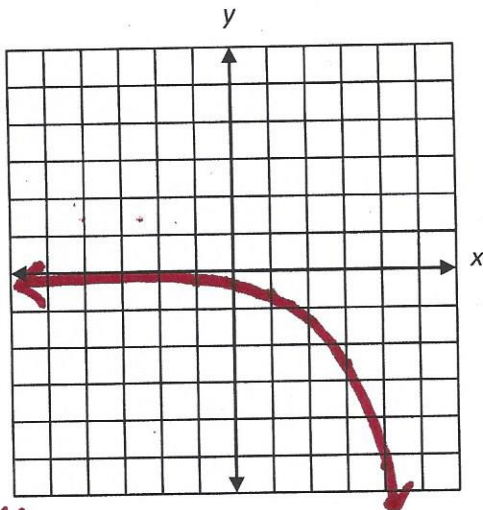
$$x^2 - x - 20 = 0$$

$$(x-5)(x+4) = 0$$

$$x = 5 \quad x = -4$$

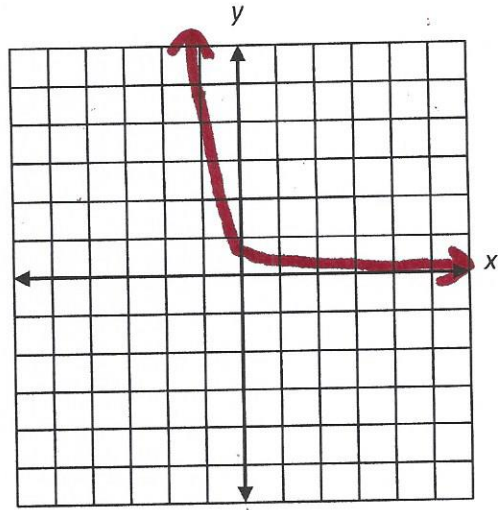
Graph the function.

39. $f(x) = -\frac{1}{3} \cdot 2^x$



(0, $-\frac{1}{3}$) Asymptote: $y=0$
Domain: \mathbb{R} Range: $y < 0$

40. $f(x) = 0.65e^{-2x}$

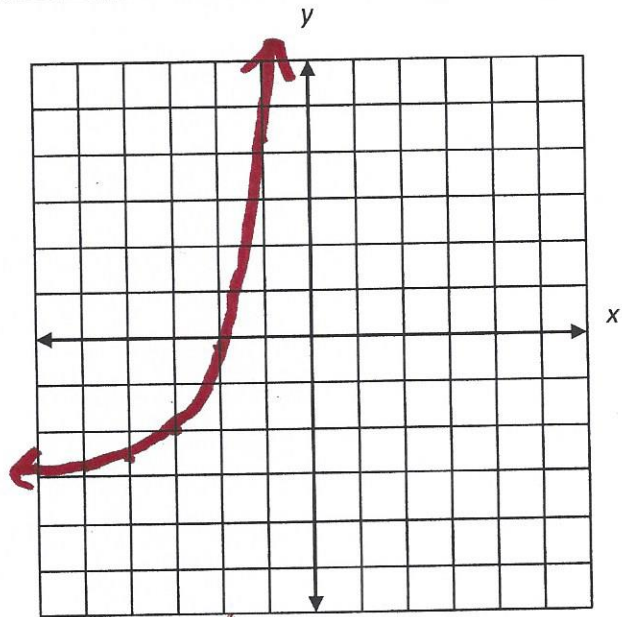


(0, $.65$) Asymptote: $y=0$
Domain: \mathbb{R} Range: $y > 0$

41. $f(x) = e^{x+3} - 3$

(0, 17.086) Asymptote: $y=-3$

Domain: \mathbb{R} Range: $y > -3$



42. You buy a computer for \$1200. The value of the computer decreases by 32% each year. Find the value of the computer after 6 years.

$$y = 1200(1 - 0.32)^x$$

$$y = 1200(.68)^6$$

$$y = \$118.64$$

43. The number of bacteria present on the classroom floor increases by 10% each hour throughout the school day. Before school, there were 1345 bacteria on the floor. The total amount of bacteria after t hours can be found by using the formula: $A = 1345(1.1)^t$. How many bacteria will be present after 6 hours?

$$A = 1345(1.1)^6$$

$$\approx \text{2383 bacteria}$$

44. You deposit \$3000 in an account that pays 5% annual interest. What is the balance after 4 years if the annual interest is compounded:

a) Yearly $A = 3000\left(1 + \frac{0.05}{1}\right)^{1 \cdot 4}$ $\$3646.52$

b) Quarterly $A = 3000\left(1 + \frac{0.05}{4}\right)^{4 \cdot 4}$ $\$3659.67$

c) Monthly $A = 3000\left(1 + \frac{0.05}{12}\right)^{12 \cdot 4}$ $\$3662.69$

d) Continuously $A = 3000e^{0.05(4)}$ $\$3664.21$

45. You deposit \$2500 in an account that pays 2.5% annual interest. What is the balance after 7 years if the annual interest is compounded:

e) Yearly $A = 2500\left(1 + \frac{0.025}{1}\right)^{1 \cdot 7}$ $\$2971.71$

f) Quarterly $A = 2500\left(1 + \frac{0.025}{4}\right)^{4 \cdot 7}$ $\$2976.49$

g) Monthly $A = 2500\left(1 + \frac{0.025}{12}\right)^{12 \cdot 7}$ $\$2977.57$

h) Continuously $A = 2500e^{0.025 \cdot 7}$ $\$2978.12$

Find the inverse of the function.

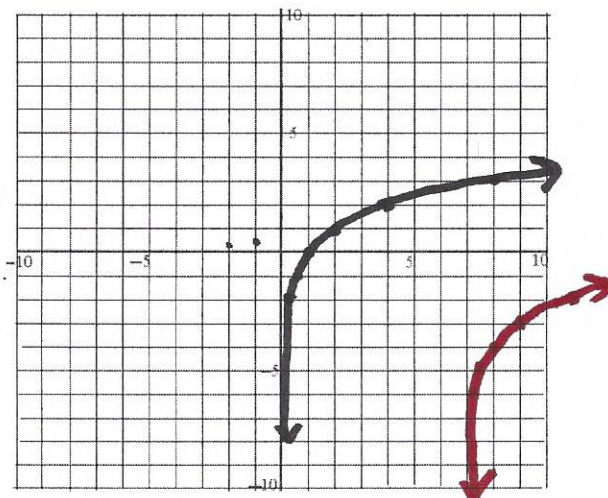
<p>46. $y = \log_4(x-3)$ $x = \log_4(y-3)$ $4^x = y-3$ $\begin{matrix} 4^x & = & y-3 \\ +3 & & +3 \end{matrix}$ $4^x + 3 = y$ <u>$y = 4^x + 3$</u></p>	<p>47. $y = (5)^x$ $x = 5^y$ $\log_5 x = \log_5 5^y$ $\log_5 x = y$ <u>$y = \log_5 x$</u></p>
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48. Graph the function. State the domain and range.

$y = \log_2(x-7) - 4$
 right 7 down 4

x	y
1/4	-2
1/2	-1
1	0
2	1
4	2
8	3

parent Domain: $x > 0$ Range: \mathbb{R}
 transformation $x > 7$ \mathbb{R}



49. Write an exponential function $y = ab^x$ whose graph passes through the given points. (3,1) and (5,4)

$$1 = ab^3 \rightarrow a = \frac{1}{b^3}$$

$$4 = ab^5 \quad a = \frac{1}{8}$$

$$4 = \frac{1}{b^3} b^5 \quad b = 2$$

$$4 = \frac{b^5}{b^3} \quad a = \frac{1}{8}$$

$$4 = b^2 \quad b = -2$$

$y = \frac{1}{8} \cdot 2^x$
 or
 $y = \frac{1}{8} \cdot -2^x$