Solve for x.

1. $125 = 5^{x-2}$
2. $5 = 5^{x+4}$
3. $1 = 7^{x-2}$
4. $\frac{1}{81} = 9^{x}$

5. $\frac{64}{27} = \left(\frac{4}{3}\right)^{x-1}$
6. $\frac{25}{4} = \left(\frac{2}{5}\right)^{x}$
7. $\frac{16}{625} = \left(\frac{2}{5}\right)^{-x}$
8. $\frac{7}{9} = \left(\frac{81}{49}\right)^{x}$

Write in logarithmic form.

9. $x - 3 = 10^{y}$
10. $y = 3^{x-2}$
11. $e^{x} = y$
12. $y + 2 = 2^{x}$

Write in exponential form.

13. $\log_4 x = y - 1$
14. $\log y = x$
15. $x - 2 = \log_{1/3} y$
16. $\ln (y - 3) = x + 1$

Evaluate.

17. $\log_{2/3}\left(\frac{4}{9}\right)$
18. $\log_5 \sqrt[3]{5}$
19. $\log_7\left(\frac{1}{49}\right)$
20. $\ln e$

Express as the sum, difference and/or product of logarithms.

21. $\log\left(\dfrac{\sqrt[5]{y^3}}{\sqrt[3]{x^2}}\right)$

22. $\log_2\left(\dfrac{5x^2}{y^3}\right)$

23. $\ln\left(\dfrac{3\sqrt{x}}{y^2}\right)$

Write as a single logarithm.

24. $\dfrac{1}{2}\ln x - \dfrac{1}{3}\ln y^2$

25. $3\log 2 + 2\log x + \log(x-4)$

26. $\log_5(3x+2) + \log_5(x-2)$

Solve for x.

27. $\log_x 64 = 3$

28. $\log_{27} x = 1/3$

29. $\log_x 5 = \dfrac{1}{2}$

30. $\log_2(1/16) = x$

31. $\log x = -2$

32. $\log_2 29 = \log_2(2x-1)$

33. $\dfrac{1}{2}\log_5 x = \log_5 9$

34. $\dfrac{1}{4}\log_2(5x+6) = 2$

35. $\log_2 x + \log_2(x+3) = \log_2 4$

36. $\log_5(3x) - \log_5(x-2) = 2\log_5 3$

37. $\log_4(2x-5) = \log_4(2x-3) + 1$

38. $\log_3 x + \log_3(x-6) = 3$

39. $\log(7x+4) - \log(x-2) = 1$

40. $\log_4(2x-3) = 2 - \log_4(2x+3)$

41. $2\log_3 x - \log_3(2x+1) = -1$

Solve for x. Round the answer to 2 decimal places.

42. $\ln x = .34$

43. $5^{x+1} = 12$

44. $15e^{2x-3} = 27$

$\text{ph} \approx -\log\left[\text{H}^+\right]$

45. Find the pH of a sample taken at a water treatment plant is found to have a $\left[\text{H}^+\right]$ concentration of 5.6×10^{-7} moles per liter.

46. Find the $\left[\text{H}^+\right]$ concentration of a sample taken at a water treatment plant that has a pH of 4.6.

A population increase (or decrease) is described by the equation $A = A_o e^{rt}$ where A_o is the initial population, A is the final population, r is the the annual growth rate and t is the time in years.

47. A new company starts with 90 employes. They expect that the number will increase by 15.7% a year. How many employes will the zoo have in 6 years?

48. A city of 26,000 people expects a growth rate of 4.7% a year. How many years will it take for the city population to increase to 42,00 people?

$A = A_o(1/2)^{t/h}$ A_o is the original amount of material, t is the time it decays, h is the half life of the material and A is the final amount left of the material.

49. The half live of a radioactive material is 80 years. If you have 1000 grams today, how many grams will you have in 300 years?

50. The half live of a radioactive material is 2000 years. How long will it take 200 grams to decay to 30 grams.

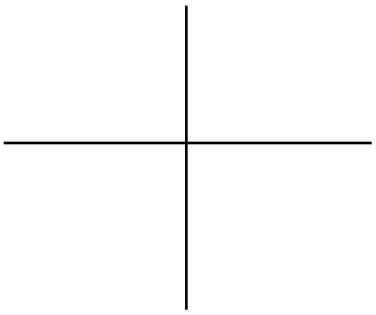
$A = P\left(1 + \frac{r}{n}\right)^{nt}$ where P is the initial investment, A is the final accrued amount, r is the the annual interest rate , n is the number of compounding periods a year and t is the number of years.

51. What is the final accrued amount if $ 18,600 is invested for 5 years in a CD that pays 6.5% compounded monthly?

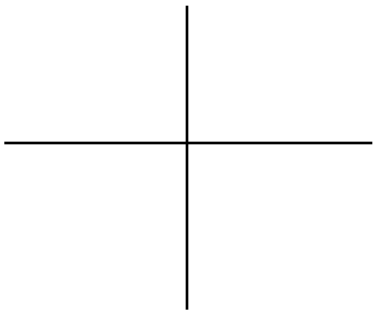
52. How long will it take $ 300 to grow to $ 1,000 if it invested at 9.5% compounded semi annually?

Graph each function. Show the intercept, asymptote and graph.

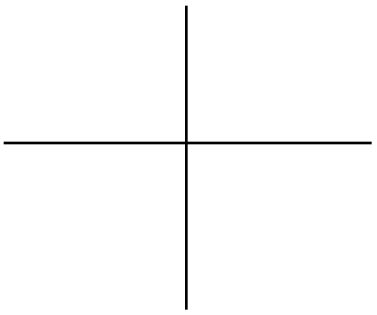
53) $y = 4^x$



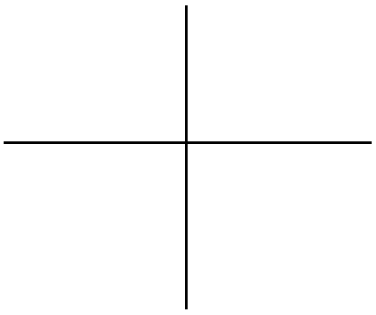
54) $y = 2^{x+1}$



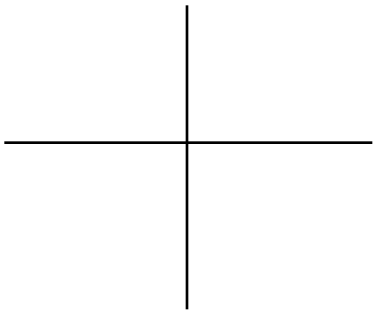
55) $y = 3^x - 2$



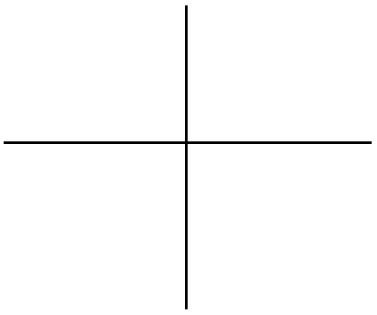
56) $y = 4^x + 3$



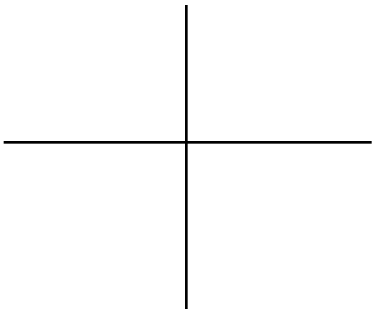
57) $y = 3^{x-2}$



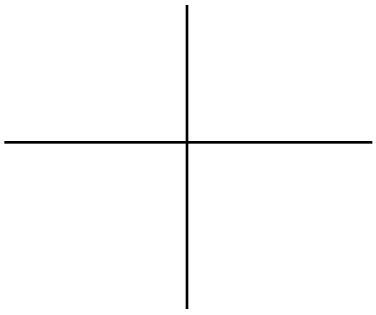
58) $y = -6^x$



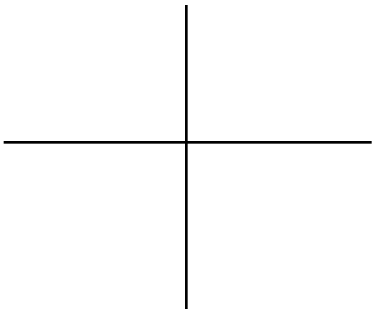
59) $y = \log_2 x$



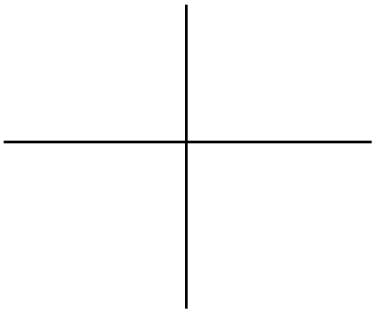
60) $y = \log_{2/3}(x)$



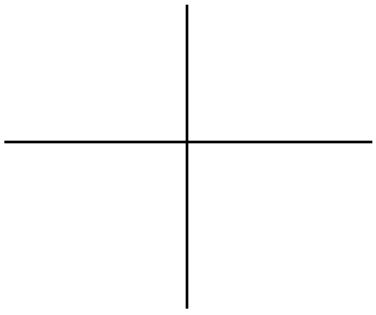
61) $y = \log_4(x+2)$



62) $y = \log_{1/2}(x-3)$



63) $y = \log_{3/4}(-x)$



64) $y = -\log_5 x$