Calculus Exponentials / ~~Logarithms~~ Review Name: Key Hr:____

Describe the transformation needed to transform the graph of $h(x) = 2^x$ into the graph of the given function.

1. $g(x) = -2^x$ ___reflect over x-axis___

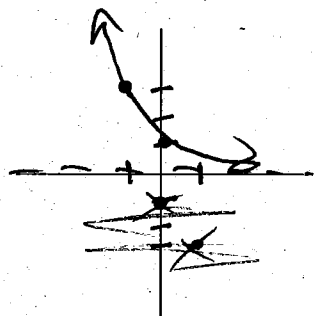2. $g(x) = 2^{x-1}$ ___right 1___

3. $g(x) = 3(2^{x+4}) + 5$ ___v-stretch of 3, left 4, up 5___
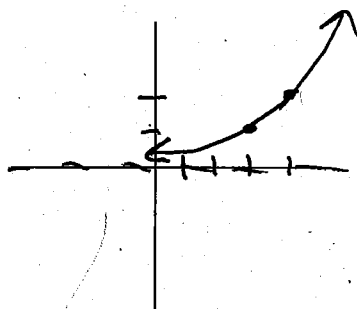
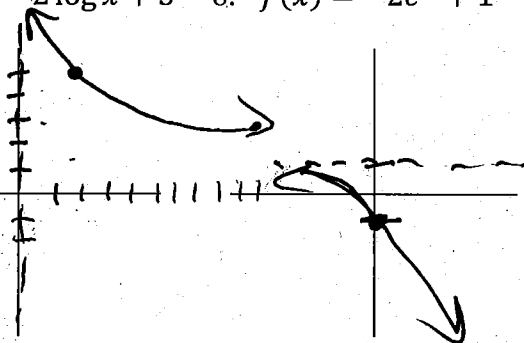4. $g(x) = 2^{-x}$ ___reflect over y-axis___
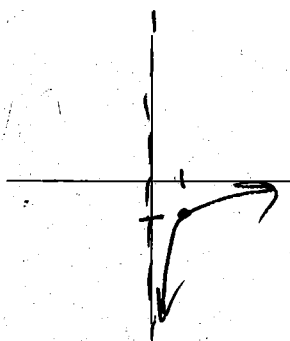
Sketch a graph of each function

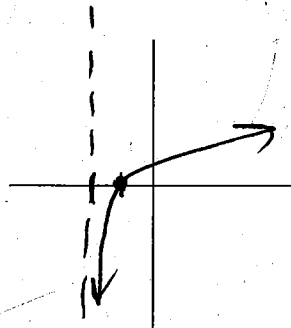5. $h(x) = 3^{-x}$ 6. $f(x) = 2^{x-3}$ 7. $g(x) = -2\log x + 5$ 8. $f(x) = -2e^x + 1$
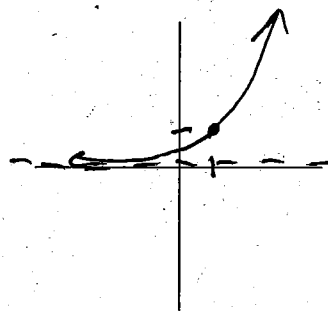
9. $f(x) = \ln x - 1$ 10. $g(x) = \ln(x + 2)$ 11. $h(x) = e^{x-1}$ 12. $f(x) = \ln(-x)$
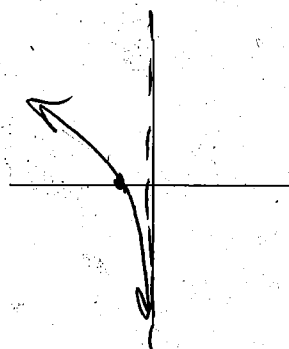
Solve each equation. Give exact answers, then use a calculator to find an approximate answer.

13. $5^x = 4$

$\boxed{X = \log_5(4)}$

$X = \boxed{0.861}$

14. $e^{-3x} = 2$

$-3x = \ln(2)$

$\boxed{X = -\frac{1}{3}\ln(2)}$

$X = \boxed{-0.231}$

15. $3^{2-x} + 1 = 17$

$3^{a-x} = 16$

$2 - x = \log_3(16)$

$X = \boxed{2 - \log_3(16)}$

$X = \boxed{-0.524}$

Evaluate the given expression without using a calculator.

16. $\log_2 32$

$$5$$

17. $\log_4 \sqrt[3]{4}$

$$\frac{1}{3}$$

18. $\log_{16} 4$

$$\frac{1}{2}$$

19. $\log_7 1$

$$0$$

20. $\log_{27} 9$

$$\frac{2}{3}$$

21. $\log_x x^3$

$$3$$

22. $\log_5 \frac{1}{25}$

$$-2$$

23. $\ln \frac{1}{e^3}$

$$-3$$

Use the properties of logarithms to expand the following expressions completely.

24. $\log_3 5xy$ $\log_3(5) + \log_3(x) + \log_3(y)$

25. $\log_4 \frac{x}{4}$ $\log_4(x) - \log_4(4)$ or $\log_4(x) - 1$

26. $\log_5 \frac{7x^2 y^3}{4x}$ $\log_5(7) + 2\log_5(x) + 3\log_5(y) - \log_5(4) - \log_5(x)$

27. $\ln \sqrt{\frac{x^2}{y^3}}$ $\frac{1}{2}(2\ln(x) - 3\ln(y))$ $\ln(x) - \frac{3}{2}$

Write the expression as a single logarithm (condense).

28. $2\ln 3 + 5\ln x$ $\ln(9x^5)$

29. $\log_3 x + \log_3 y - 2\log_3 z$ $\log_3\left(\frac{xy}{z^2}\right)$

30. $\frac{1}{2}\log_5 16 + 3\log_5(x-1) - \log_5(x+2)$ $\log_5\left(\frac{4(x-1)^3}{x+2}\right)$

Solve for x without a calculator.

31. $3^x = 243$

$$X = 5$$

32. $8^x = 4$

$$X = \frac{2}{3}$$

33. $\log_5 5x = 2$

$5x = 5^2$

$$x = 5$$

34. $\log_{12} x = -2$

$X = 12^{-2} = \frac{1}{144}$

35. $3^{2x-1} = 27$

$2x - 1 = 3$

$$X = 2$$

36. $-3 = \log_4 x^2$

$x^2 = 4^{-3} = \frac{1}{64}$

$$x = \pm \frac{1}{8}$$

37. $\ln(2x - 1) = 0$

$2x - 1 = 1$

$$X = 1$$

38. $\log_2 x + \log_2(x+2) = \log_2(x+6)$

$x^2 + 2x = x + 6$

$x^2 + x - 6 = 0$

$(x+3)(x-2) = 0$ $X = \cancel{-3}, 2$

39. $\log_3 x + \log_3(x^2 - 8) = \log_3 8x$

$x^3 - 8x = 8x$

$x^3 - 16x = 0$

$x(x+4)(x-4) = 0$ $X = 4, \cancel{-4}, \cancel{0}$

40. $\log_2(x+5) - \log_2(x-2) = 3$

$\frac{x+5}{x-2} = 8$ $7x = 21$

$x + 5 = 8x - 16$ $X = 3$

41. $\log(x+4) - \log x = \log(x+2)$

$\frac{x+4}{x} = x+2$ $0 = x^2 + x - 4$

$x + 4 = x^2 + 2x$ $X = \frac{-1 \pm \sqrt{17}}{2} = \frac{-1+\sqrt{17}}{2}$