

Without graphing, determine whether each equation represents exponential growth or exponential decay. Then find the rate of growth or decay and the initial amount (y-intercept).

1.  $y = 0.5(1.67)^x$

growth

$1.67 - 1 = 0.67$

67%

2.  $y = 1.14^x$

growth

$1.14 - 1 = 0.14$

14%

3.  $y = 2\left(\frac{9}{10}\right)^x$

decay

$1 - 0.9 = 0.1$

4.  $y = 4.1(0.72)^x$

decay

$1 - 0.72 = 0.28$

5. Mr. Andersen put \$1000 into an account that earns 4.5% annual interest. The interest is compounded annually and there are no withdrawals. How much money will be in the account at the end of 30 years?

$n = 1$   
 $a = 1000$   
 $r = 0.045$

$t = 30$

$y = 1000(1 + \frac{0.045}{1})^{30} = \$3745.32$

6. A manufacturer bought a new rolling press for \$48,000. It has depreciated in value at an annual rate of 15%. What is its value 5 years after purchase? Round to the nearest hundred dollars.

$n = 1$   
 $a = 48000$   
 $r = 0.15$

$t = 5$

$y = 48000(1 - \frac{0.15}{1})^5 = \$21297.86$

7. You place \$900 in an investment account that earns 6% interest compounded continuously. Find the balance after 5 years.

$a = 900$   
 $t = 5$   
 $r = 0.06$

$y = 900e^{(0.06)(5)}$

$y = \$1214.87$

Graph each function as a transformation of its parent function. Identify the end behavior, asymptote, domain, and range.

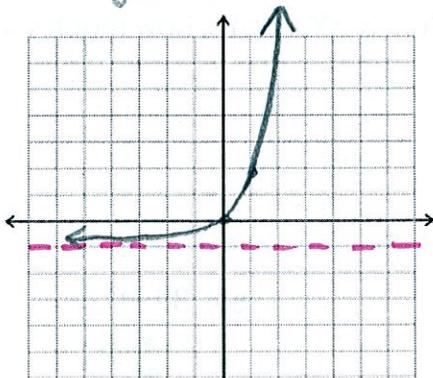
8.  $y = 3^x - 1$

Asymptote:  $y = -1$

Domain:  $(-\infty, \infty)$

Range:  $(-1, \infty)$

EB:  $y \rightarrow -1, x \rightarrow -\infty$   
 $y \rightarrow \infty, x \rightarrow \infty$



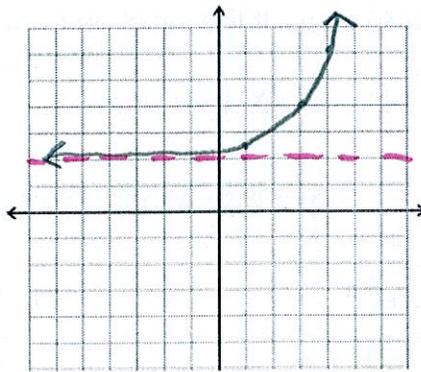
9.  $y = (2)^{x-2} + 2$

Asymptote:  $y = 2$

Domain:  $(-\infty, \infty)$

Range:  $(2, \infty)$

EB:



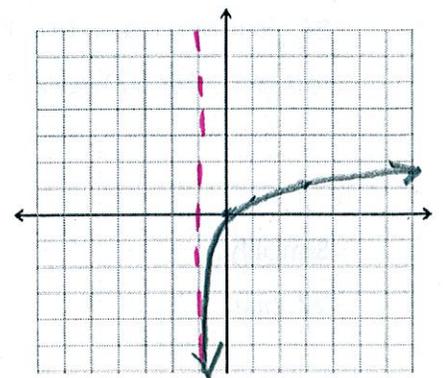
10.  $y = \log_4(x + 1)$

Asymptote:  $x = -1$

Domain:  $(-1, \infty)$

Range:  $(-\infty, \infty)$

EB:



Write each equation in logarithmic form.

11.  $100 = 10^2 = 100$

$\log_{10} 100 = 2$

12.  $9^3 = 729$

$\log_9 729 = 3$

13.  $64 = 4^3 = 64$

$\log_4 64 = 3$

Evaluate each logarithm.

14.  $\log 1000$

3

15.  $\log_4 256$

4

16.  $\log_{27} 9$

$\frac{2}{3}$

Solve each equation.

17.  $\log_3(x+1) = 4$

$3^4 = x+1$

$81 = x+1$

$x = 80$

19.  $\log x + \log 2 = 5$

$\log 2x = 5$

$10^5 = 2x$

$100000 = 2x$

21.  $6^{3x+2} = 18$

$(3x+2) \log 6 = \log 18$

$3x+2 = 1.6131$

$3x = -0.3869$

24.  $5e^{2x} - 1 = 9$

$5e^{2x} = 10$

$e^{2x} = 2$

$\ln e^{2x} = \ln 2$

$2x = \ln 2$

$x = \frac{\ln 2}{2}$

$x = 0.3466$

18.  $e^{\frac{x}{4}} = 5$

$\ln e^{\frac{x}{4}} = \ln 5$

$\frac{x}{4} = \ln 5$

$x = 4 \ln 5 = 6.4378$

20.  $\ln x - \ln 4 = 7$

$\ln \frac{x}{4} = 7$

$e^{\ln \frac{x}{4}} = e^7$

$\frac{x}{4} = e^7$

$x = 4e^7$

$x = 4386.53$

22.  $e^{3x}e^{2x} = 20$

$e^{5x} = 20$

$\ln e^{5x} = \ln 20$

$5x = \ln 20$

$x = \frac{\ln 20}{5}$

$x = 0.5991$

25.  $\log 3 + \log x = \log 12$

$\log 3x = \log 12$

$3x = 12$

$x = 4$

26. Radium has a half-life of 1660 years. If the initial amount of radium is 200 grams, how much will remain after 500 years?

$y = 200 (0.5)^{\frac{500}{1660}}$

$y = 162.3 \text{ grams}$

Simplify.

27.  $\ln e^6$

6

28.  $e^{\ln 3}$

3

29.  $\log_2 2$

1

30.  $3^{\log_3 8}$

8