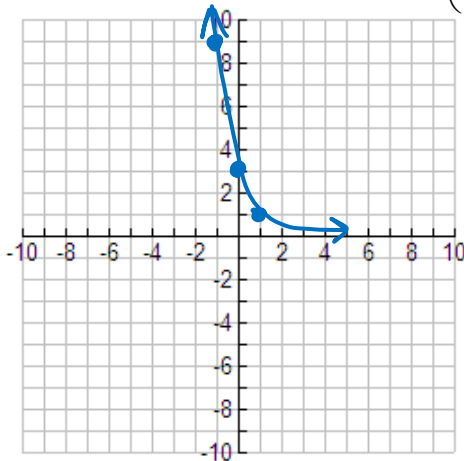


Algebra 2 Trig
CH. 9 REVIEW

Name key

NO CALCULATOR

1. Draw the graph of $f(x) = 3\left(\frac{1}{3}\right)^x$ without a calculator.



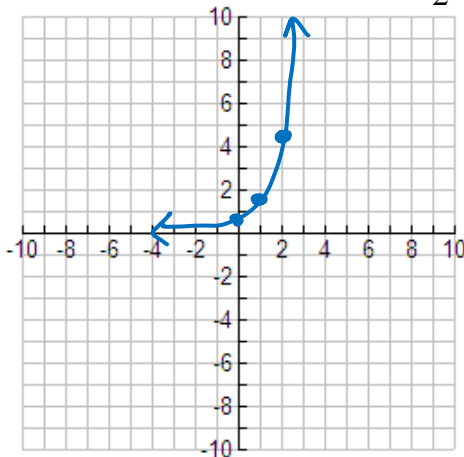
State the domain: \mathbb{R}

State the range: $y > 0$

y-intercept: 3

Growth or Decay? decay

2. Draw the graph of $f(x) = \frac{1}{2}(3)^x$ without a calculator.



State the domain: \mathbb{R}

State the range: $y > 0$

y-intercept: $\frac{1}{2}$

Growth or Decay? growth

Solve for x without a calculator.

3. $\log_3 27 = x$
 $3^x = 27$
 $x = 3$

4. $\log_3 x = -1$
 $3^{-1} = x$
 $\frac{1}{3} = x$

5. $\log_5 \frac{1}{125} = x$
 $5^x = \frac{1}{125}$
 $x = -3$

6. $\log_{16} x = \frac{3}{4}$
 $16^{\frac{3}{4}} = x$
 $(2^4)^{\frac{3}{4}} = x$
 $2^3 = x$
 $8 = x$

7. $\log_x 11 = \frac{1}{2}$
 $(x^{\frac{1}{2}})^2 = (11)^2$
 $x = 121$

8. $\log_x 216 = -3$
 $(x^{-\frac{1}{3}})^3 = (216)^{\frac{1}{3}}$
 $x = (6^3)^{-1}$
 $x = 6^{-1}$
 $x = \frac{1}{6}$

9. $64^{5x-1} = 4^{7x+2}$
 $4^3(5x-1) = 4^{7x+2}$
 $15x - 3 = 7x + 2$
 $8x = 5$
 $x = \frac{5}{8}$

10. $\left(\frac{1}{9}\right)^{2x-1} = (81)^{x-5}$
 $3^{-2(2x-1)} = 3^{4(x-5)}$
 $-4x + 2 = 4x - 20$
 $22 = 8x$
 $\frac{11}{4} = x$

11. $\log_7 2 + \log_7 9 = \log_7 x$
 $\log_7 18 = \log_7 x$
 $18 = x$

12. $\log_7 x + \log_7 (x+4) = \log_7 60$
 $\log_7 x(x+4) = \log_7 60$
 $x^2 + 4x = 60$
 $x^2 + 4x - 60 = 0$
 $(x+10)(x-6) = 0$
 $x = -10$ or $x = 6$

13. $\log_4 2x - \log_4 5 = \frac{1}{2}$
 $\log_4 \frac{2x}{5} = \frac{1}{2}$
 $5 \cdot 4^{\frac{1}{2}} = \frac{2x}{5} \cdot 5$
 $10 = 2x$
 $5 = x$

14. $2\log_5 x = \log_5 9$
 $\log_5 x^2 = \log_5 9$
 $x^2 = 9$
 $x = \pm 3$
 $x = 3$

15. $\log_{10} 10 + \log_{10} 100 = x$
 $\log_{10} 1000 = x$
 $10^x = 1000$
 $x = 3$

16. $\log_5 150 - \log_5 6 = \log_5 x$
 $\log_5 \frac{150}{6} = \log_5 x$
 $25 = x$

17. $\log x + \log 5 = 2$
 $\log_{10} 5x = 2$
 $10^2 = 5x$
 $20 = x$

Rewrite in terms of a single logarithm. Let $a = \log_2 4$ and $b = \log_2 11$.

18. $\log_2 44$
 $\log_2 (4 \cdot 11)$
 $\log_2 4 + \log_2 11$
 $a + b$

19. $\log_2 \frac{11}{4}$
 $\log_2 11 - \log_2 4$
 $b - a$

20. $\log_2 22$
 $\log_2 11 \cdot 2$
 $\log_2 11 + \log_2 2$
 $b + 1$

21. $\log_2 \frac{1}{11}$
 $\log_2 1 - \log_2 11$
 $0 - b$
 $-b$

22. $\log_2 32$
 $\log_2 16 \cdot 2$
 $\log_2 4^2 + \log_2 2$
 $2a + 1$

Write an exponential equation that passes through the points:

23. $(0, 4)$ and $(3, 32)$
 $32 = 4b^3$
 $8 = b^3$
 $2 = b$
 $y = 4(2)^x$

24. $(1, \frac{1}{3})$ and $(3, 3)$
 $3 = ab^3$
 $\frac{1}{3} = ab^1$
 $9 = b^2$
 $3 = b$

$3 = a(3)^3$
 $3 = 27a$
 $\frac{1}{9} = a$
 $y = \frac{1}{9}(3)^x$

Determine whether each function represents exponential growth or decay.

25. $y = 5(4)^x$
 growth

26. $y = \frac{1}{3} \cdot (8)^x$
 growth

27. $y = 4 \cdot 5^{-x} \rightarrow 4 \cdot \left(\frac{1}{5}\right)^x$
 decay

CALCULATOR OKAY

Solve for x algebraically and using your calculator. Round all solutions to the nearest hundredth.

$$1. 7^{x+5} = 11$$

$$\log_7 11 = x+5$$

$$\frac{\log 11}{\log 7} = x+5$$

$$1.2323 = x+5$$

$$\boxed{-3.77 = x}$$

$$2. 4^x = 15$$

$$x \cdot \log 4 = \log 15$$

$$x = \frac{\log 15}{\log 4}$$

$$\boxed{x = 1.95}$$

$$3. 3^{5x-1} = 4^{7x+2}$$

$$(5x-1)\log 3 = (7x+2)\log 4$$

$$5x-1 = (7x+2) \cdot 1.2619$$

$$5x-1 = 8.8333x + 2.5238$$

$$-3.5238 = 3.8333x$$

$$\boxed{-0.92 = x}$$

$$4. 18(2)^{3x-5} - 7 = 29$$

$$18(2)^{3x-5} = 36$$

$$2^{3x-5} = 2^1$$

$$3x-5 = 1$$

$$3x = 6$$

$$\boxed{x = 2}$$

$$5. \log_5 2 = x^2 - 2$$

$$\frac{\log 2}{\log 5} = x^2 - 2$$

$$.4307 = x^2 - 2$$

$$2.4307 = x^2$$

$$\boxed{\pm 1.56 = x}$$

$$6. \log_{10}(3x-5) = 4$$

$$10^4 = 3x-5$$

$$10000 = 3x-5$$

$$10005 = 3x$$

$$\boxed{3335 = x}$$

$$7. 10e^{4x+1} + 5 = 35$$

$$10e^{4x+1} = 30$$

$$e^{4x+1} = 3$$

$$\log_e 3 = 4x+1$$

$$\ln 3 = 4x+1$$

$$1.0986 = 4x+1$$

$$.0986 = 4x$$

$$\boxed{.02 = x}$$

$$8. \ln(3x-5) = 4$$

$$\log_e (3x-5) = 4$$

$$e^4 = 3x-5$$

$$54.5982 = 3x-5$$

$$59.5982 = 3x$$

$$\boxed{19.87 = x}$$

Round all word problem answers to the nearest hundredth.

9. Aaron put \$2,000 in a bank account with a rate of 1.2% compounded monthly. How long will it take him to earn \$2,200?

$$\begin{aligned}2200 &= 2000 \left(1 + \frac{.012}{12}\right)^{12t} \\1.1 &= (1.001)^{12t} \\ \log 1.1 &= 12t \cdot \log 1.001 \\95.3578 &= 12t\end{aligned}$$

$$t = 7.95 \text{ years}$$

10. Liz put \$1,000 in a bank account 15 years ago. The rate was 2.2% and it was compounded quarterly. How much money is currently in her account?

$$A = 1000 \left(1 + \frac{.022}{4}\right)^{4(15)}$$

$$A = \$1389.71$$

12. The house built near Hinsdale Central 5 years ago was sold for \$1 million. It has appreciated at a rate of 1.4% per year. How much is the house currently worth?

$$A = 1000000 (1 + .014)^5$$

$$A = \$1,071,987.63$$

13. In 1950, Buffalo, NY was the 15th largest city in the United States and had a population of 580,000. What is the rate of decline per year (assuming exponential) if the population in 2010 was 270,000 people?

$$\begin{aligned}270000 &= 580000 (1-r)^{60} \\ (.4655)^{\frac{1}{60}} &= (1-r)^{\frac{60}{60}}\end{aligned}$$

$$.9873 = 1-r$$

$$r = .0123$$

$$r = 1.23\%$$

14. Tony opened a bank account with \$50,000 that earns 4.26% annual interest. In how many years will the amount in his account be doubled?

$$100000 = 50000(1 + .0426)^t$$

$$2 = (1.0426)^t$$

$$\log 2 = t \cdot \log 1.0426$$

$$t = 16.62 \text{ years}$$

15. At 5:00pm, there were 50 bacteria in a petri dish. The rate of growth is 18% per minute. At what time will the bacteria reach 8,838,052?

$$8838052 = 50(1 + .18)^t$$

$$176761.04 = (1.18)^t$$

$$\log 176761.04 = t \cdot \log 1.18$$

$$t = 73 \text{ minutes}$$

$$6:13 \text{ pm}$$