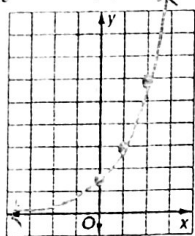


3-1 Homework Exponential Functions

Sketch the graph of each function. Then state the function's domain and range.

1. $y = 1.5(2)^x$

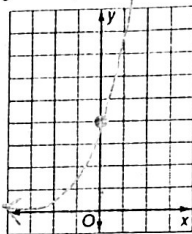


x	y
0	1.5
1	3
2	6

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

R: $(0, \infty)$

2. $y = 4(3)^x$

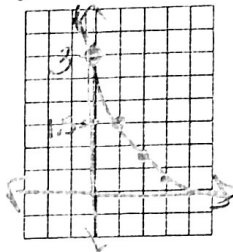


x	y
0	4
1	12
2	36

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

R: $(0, \infty)$

3. $y = 3(0.5)^x$



x	y
0	3
1	1.5
2	0.75

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

R: $(0, \infty)$

Determine whether each function represents exponential growth or decay.

4. $y = 5(0.6)^x$ Decay

5. $y = 0.1(2)^x$ growth

6. $y = 5 \cdot 4^{-x}$ $y = 5(\frac{1}{4^x})$ Decay

Write an exponential function whose graph passes through the given points.

7. (0, 1) and (-1, 4)

8. (0, 2) and (1, 10)

9. (0, -3) and (1, -1.5)

10. (0, 0.8) and (1, 1.6)

11. (0, -0.4) and (2, -10)

12. (0, π) and (3, 8π)

Simplify each expression.

13. $(2\sqrt{2})\sqrt{8}$

$2\sqrt{16} = 2^4$

14. $(n\sqrt{3})\sqrt{75}$

$n\sqrt{225} = n^5$

15. $y^{\sqrt{6}} \cdot y^{5\sqrt{6}}$ $y^{6\sqrt{6}}$

16. $13\sqrt{6} \cdot 13\sqrt[3]{24}$

$13^3\sqrt{6}$

17. $n^3 \div n^\pi$

$n^{3-\pi}$

18. $\frac{125\sqrt{11}}{5^3\sqrt{11}} \div 5\sqrt{11}$ $5^2\sqrt{11}$

Solve each equation or inequality. Check your solution.

19. $3^{3x-5} > 81$

20. $7^{6x} = 7^{2x-20}$

21. $3^{6n-5} < 9^{4n-3}$

22. $9^{2x-1} = 27^x + 4$

23. $2^{3n-1} \geq (\frac{1}{8})^n$

24. $16^{4n-1} = 128^{2n+1}$

BIOLOGY For Exercises 25 and 26, use the following information.

The initial number of bacteria in a culture is 12,000. The number after 3 days is 96,000.

25. Write an exponential function to model the population y of bacteria after x days.

26. How many bacteria are there after 6 days?

27. EDUCATION A college with a graduating class of 4000 students in the year 2002 predicts that it will have a graduating class of 4862 in 4 years. Write an exponential function to model the number of students y in the graduating class t years after 2002.

$(0, 4000) (4, 4862)$

$4862 = 4000b^4$

$1.215 = b^4$

$b = 1.05$

$y = 4000(1.05)^t$

$$y = ab^x$$

7. $4 = 1(b)^{-1}$

$$4 = \frac{1}{b} \quad b = \frac{1}{4}$$

$$\frac{1}{\frac{1}{4}} = \frac{1}{\frac{1}{4}}$$

$$y = 1\left(\frac{1}{4}\right)^x$$

8. $10 = 2(b)^1$

$$b = 5$$

$$y = 2(5)^x$$

9. $-1.5 = -3(b)^1$

$$b = \frac{1}{2}$$

$$y = -3\left(\frac{1}{2}\right)^x$$

10. $1.6 = 0.8(b)^1$

$$b = 2$$

$$y = 0.8(2)^x$$

11. $-10 = -0.4(b)^2$

$$25 = b^2$$

$$b = 5$$

$$y = -0.4(5)^x$$

12. $8\pi = \pi(b)^3$

$$8 = b^3$$

$$b = 2$$

$$y = \pi(2)^x$$

$$19. 3^{3x-5} > 81$$

$$3^{3x-5} > 3^4$$

$$\begin{array}{r} 3x-5 > 4 \\ +5 \quad +5 \\ \hline \end{array}$$

$$3x > 9$$

$$\boxed{x > 3}$$

$$20. 7^{6x} = 7^{2x-20}$$

$$6x = 2x - 20$$

$$\begin{array}{r} 6x = 2x - 20 \\ -2x \quad -2x \\ \hline \end{array}$$

$$4x = -20$$

$$\boxed{x = -5}$$

$$21. 3^{6n-5} < 9^{4n-3}$$

$$3^{6n-5} < (3^2)^{4n-3}$$

$$3^{6n-5} < 3^{8n-6}$$

$$6n-5 < 8n-6$$

$$\begin{array}{r} 6n-5 < 8n-6 \\ -6n \quad -6n \\ \hline \end{array}$$

$$-5 < 2n-6$$

$$\begin{array}{r} -5 < 2n-6 \\ +6 \quad +6 \\ \hline \end{array}$$

$$1 < 2n \quad \boxed{n > 1/2}$$

$$22. 9^{2x-1} = 27^{x+4}$$

$$(3^2)^{2x-1} = (3^3)^{x+4}$$

$$3^{4x-2} = 3^{3x+12}$$

$$4x-2 = 3x+12$$

$$\begin{array}{r} 4x-2 = 3x+12 \\ -3x \quad -3x \\ \hline \end{array}$$

$$1x-2 = 12$$

$$\begin{array}{r} 1x-2 = 12 \\ +2 \quad +2 \\ \hline \end{array}$$

$$\boxed{1x = 14}$$

$$23. 2^{3n-1} \geq \frac{1}{8}^n$$

$$2^{3n-1} \geq (8^{-1})^n$$

$$2^{3n-1} \geq ((2^3)^{-1})^n$$

$$2^{3n-1} \geq 2^{-3n}$$

$$\begin{array}{r} 3n-1 \geq -3n \\ -3n \quad -3n \end{array}$$

$$\begin{array}{r} * \\ \frac{-1}{-6} \geq \frac{-6n}{-6} \\ \boxed{\frac{1}{6} \leq n} \end{array}$$

$$24. 16^{4n-1} = 128^{2n+1}$$

$$(2^4)^{4n-1} = (2^7)^{2n+1}$$

$$2^{16n-4} = 2^{14n+7}$$

$$\begin{array}{r} 16n-4 = 14n+7 \\ -14n \quad -14n \end{array}$$

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

$$2n = 11$$

$$\boxed{n = 11/2}$$

$$25. (0, 12000) \quad (3, 96000)$$

$$96000 = 12000 b^3$$

$$8 = b^3$$

$$b = 2$$

$$\boxed{y = 12000(2)^x}$$

$$26. y = 12000(2)^6$$

$$y = 768000 \text{ bacteria}$$