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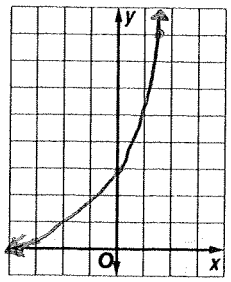
10-1 Skills Practice

Exponential Functions

ODDS except x crossed off ones

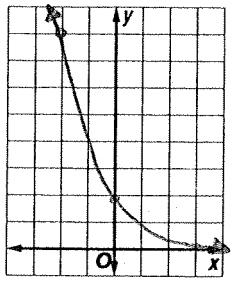
Sketch the graph of each function. Then state the function's domain and range.

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



domain: all real numbers,
range: all positive numbers

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



domain: all real numbers,
range: all positive numbers.

Determine whether each function represents exponential *growth* or *decay*.

* IF a<0, it's neither

3. $y = 3(6)^x$ growth

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

5. $y = 10^{-x}$ decay

6. $y = 2(2.5)^x$ growth

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

9. $y = ab^x$
$4 = 3(\frac{1}{2})^x$
$6 = 3b^{-1}$
$(2) = (b^{-1})^{-1}$
$\frac{1}{2} = b$

7. (0, 1) and (−1, 3) $y = (\frac{1}{3})^x$ (0, a)

8. (0, 4) and (1, 12) $y = 4(3)^x$

9. (0, 3) and (−1, 6) $y = 3(\frac{1}{2})^x$

10. (0, 5) and (1, 15) $y = 5(3)^x$

11. (0, 0.1) and (1, 0.5) $y = 0.1(5)^x$

12. (0, 0.2) and (1, 1.6) $y = .2(8)^x$

Simplify each expression.

Multiply exp.

13. $(3^{\sqrt{3}})^{\sqrt{3}}$ 27

14. $(x^{\sqrt{2}})^{\sqrt{7}}$ $x^{\sqrt{14}}$

Add exp.

15. $5^{2\sqrt{3}} \cdot 5^{4\sqrt{3}}$ $5^{6\sqrt{3}}$

16. $x^{3\pi} \div x^{\pi}$ $x^{2\pi}$

Solve each equation or inequality. Check your solution.

17. $3^x > 9$ $x > 2$ $3^x > 3^2$ $x > 2$

18. $2^{2x+3} = 32$ 1

19. $49^x \leq \frac{1}{7}$ $x \leq -\frac{1}{2}$ $7^{2x} \leq 7^{-1}$ $2x \leq -1$ $x \leq -\frac{1}{2}$

20. $4^{3x-2} = 16$ $\frac{4}{3}$

21. $3^{2x+5} = 27^x$ 5 $3^{2x+5} = (3^3)^x$ $2x+5 = 3x$ $x = 5$

22. $27^x = 3^{2x+3}$ 3

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10-2 Skills Practice

Logarithms and Logarithmic Functions

Write each equation in logarithmic form.

1. $2^3 = 8$ $\log_2 8 = 3$

2. $3^2 = 9$ $\log_3 9 = 2$

3. $8^{-2} = \frac{1}{64}$ $\log_8 \frac{1}{64} = -2$

4. $\left(\frac{1}{3}\right)^2 = \frac{1}{9}$ $\log_{\frac{1}{3}} \frac{1}{9} = 2$

Write each equation in exponential form.

5. $\log_3 243 = 5$ $3^5 = 243$

6. $\log_4 64 = 3$ $4^3 = 64$

7. $\log_9 3 = \frac{1}{2}$ $9^{\frac{1}{2}} = 3$

8. $\log_5 \frac{1}{25} = -2$ $5^{-2} = \frac{1}{25}$

Evaluate each expression.

9. $\log_5 25$ 2

9. $\log_5 25 = y \Rightarrow 5^y = 25$
$5^y = 5^2$
$y = 2$

10. $\log_9 3$ $\frac{1}{2}$

11. $\log_{10} 1000$ 3

12. $\log_{125} 5$ $\frac{1}{3}$

13. $\log_4 \frac{1}{64} = y$ -3

13. $4^y = \frac{1}{64}$ $4^y = 4^{-3}$
$y = -3$

14. $\log_5 \frac{1}{625}$ -4

15. $\log_8 8^3$ 3
Same Property...

16. $\log_{27} \frac{1}{3}$ $-\frac{1}{3}$

Solve each equation or inequality. Check your solutions.

17. $\log_3 x = 5$ 243 $3^5 = x$

18. $\log_2 x = 3$ 8

19. $\log_4 y < 0$ Can't take $\log_4 0$ $0 < y < 1$

20. $\log_{\frac{1}{4}} x = 3$ $\frac{1}{64}$

21. $\log_2 n > -2$ $n > \frac{1}{4}$ $n > 2^{-2}$

22. $\log_b 3 = \frac{1}{2}$ 9

23. $\log_6 (4x + 12) = 2$ 6

$6^2 = 4x + 12$
$24 = 4x$
$6 = x$

24. $\log_2 (4x - 4) > 5$ $x > 9$

25. $\log_3 (x + 2) = \log_3 (3x)$ 1

$x + 2 = 3x$
$2 = 2x$
$1 = x$

26. $\log_6 (3y - 5) \geq \log_6 (2y + 3)$ $y \geq 8$

Lesson 10-2

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10-3 Skills Practice

Properties of Logarithms

$\log_2 5^2 = 2(2.3219)$

Use $\log_2 3 \approx 1.5850$ and $\log_2 5 \approx 2.3219$ to approximate the value of each expression.

1. $\log_2 25$ 4.6438
   $\log_2 5 \cdot 5 = \log_2 5 + \log_2 5$
2. $\log_2 27$ 4.755
3. $\log_2 \frac{3}{5}$ −0.7369
   $\log_2 3 - \log_2 5$
4. $\log_2 \frac{5}{3}$ 0.7369
5. $\log_2 15$ 3.9069
   $\log_2 3 \cdot 5 = \log_2 3 + \log_2 5$
6. $\log_2 45$ 5.4919
7. $\log_2 75$ 6.2288
8. $\log_2 0.6$ −0.7369
9. $\log_2 \frac{1}{3}$ −1.5850
10. $\log_2 \frac{9}{5}$ 0.8481

Solve each equation. Check your solutions.

11. $\log_{10} 27 = 3 \log_{10} x$ 3
    $(27)^{1/3} = (x^3)^{1/3}$
    $3 = x$
12. $3 \log_7 4 = 2 \log_7 b$ 8
13. $\log_4 5 + \log_4 x = \log_4 60$ 12
    $\log_4 (5x) = \log_4 60$
    $5x = 60$ $x = 12$
14. $\log_6 2c + \log_6 8 = \log_6 80$ 5
15. $\log_5 y - \log_5 8 = \log_5 1$ 8
    $\log_5 \frac{y}{8} = \log_5 1$ $\frac{y}{8} = 1$ $y = 8$
16. $\log_2 q - \log_2 3 = \log_2 7$ 21
17. $\log_9 4 + 2 \log_9 5 = \log_9 w$ 100
18. $3 \log_8 2 - \log_8 4 = \log_8 b$ 2
19. $\log_{10} x + \log_{10} (3x - 5) = \log_{10} 2$ 2
    $\log_{10} (x(3x-5)) = \log_{10} 2$
    $3x^2 - 5x = 2$ → $3x^2 - 5x - 2 = 0$
    $(3x + 1)(x - 2) = 0$
    $x = -\frac{1}{3}$ $x = 2$
20. $\log_4 x + \log_4 (2x - 3) = \log_4 2$ 2
21. $\log_3 d + \log_3 3 = 3$ 9
    $\log_3 (3d) = 3$
    $3^3 = 3d$ $d = 9$
22. $\log_{10} y - \log_{10} (2 - y) = 0$ 1
23. $\log_2 s + 2 \log_2 5 = 0$ $\frac{1}{25}$
24. $\log_2 (x + 4) - \log_2 (x - 3) = 3$ 4
25. $\log_4 (n + 1) - \log_4 (n - 2) = 1$ 3
    $\log_4 \frac{n+1}{n-2} = 1$ $4^1 = \frac{n+1}{n-2}$
    $4(n-2) = n + 1$
    $4n - 8 = n + 1$ → $3n = 9$ $n = 3$
26. $\log_5 10 + \log_5 12 = 3 \log_5 2 + \log_5 a$ 15

Lesson 10-3