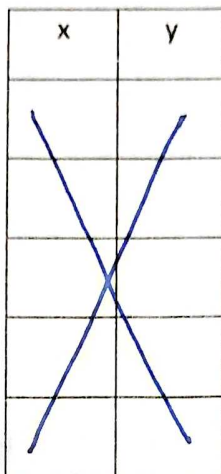
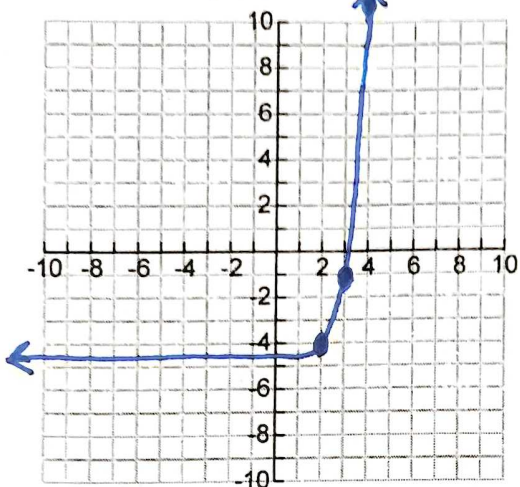


Unit 3: Exponential and Logs Test Review

Name Mr. Morton

1. Sketch the graph of the following equation.

$$f(x) = 4^{x-2} - 5$$

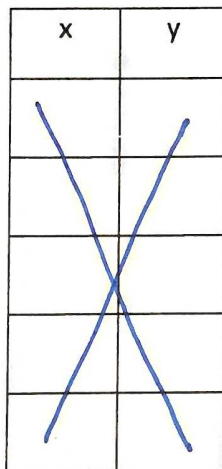
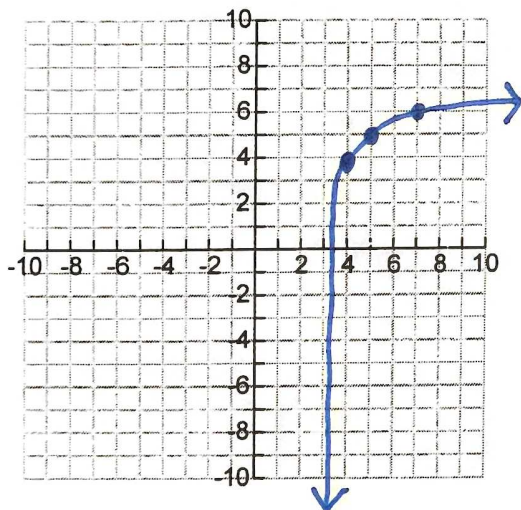


Find the following:

- Parent function: $y = 4^x$
- Transformations: Right 2
Down 5
- Domain: $\{x | x \in \mathbb{R}\}$
- Range: $\{y | y \geq -5\}$
- Asymptote: $y = -5$

2. Sketch the graph of the following equation.

$$f(x) = \log_2(x - 3) + 4$$

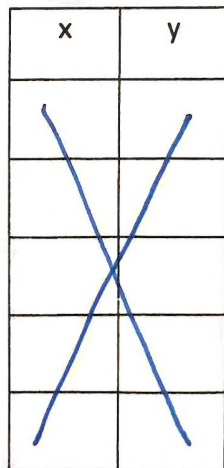
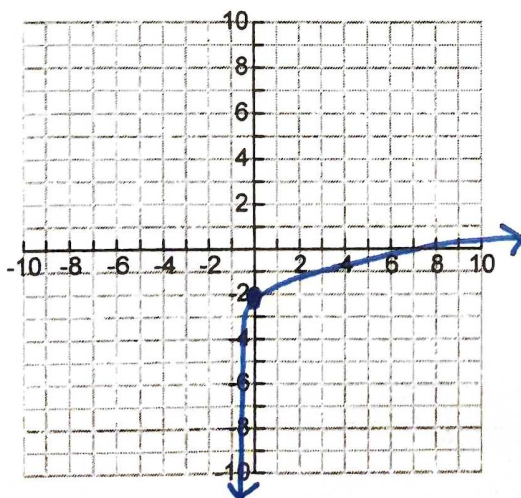


Find the following:

- Parent function: $y = \log_2(x)$
- Transformations: Right 3
Up 4
- Domain: $\{x | x \geq 3\}$
- Range: $\{y | y \in \mathbb{R}\}$
- Asymptote: $x = 3$

3. Sketch the graph of the following equation.

$$f(x) = \ln(x + 1) - 2$$



Find the following:

- Parent function: $y = \ln(x)$
- Transformations: Left 1
Down 2
- Domain: $\{x | x \geq -1\}$
- Range: $\{y | y \in \mathbb{R}\}$
- Asymptote: $x = -1$

Rewrite the following equations in logarithmic form.

4. $x^5 = 32$

$$\underline{\log_x(32) = 5}$$

5. $e^5 = x$

$$\log_e x = 5$$

↓

$$\underline{\ln(x) = 5}$$

Rewrite the following equations in exponential form.

6. $\log_5 125 = 3$

$$\underline{5^3 = 125}$$

7. $\ln 7 = x$

$$\underline{e^x = 7}$$

Solve for x.

8. $5 \log_2(x) + 4 = 19$

$$5 \log_2(x) = 15$$

$$\log_2(x) = 3$$

$$2^3 = x$$

$$\boxed{x = 8}$$

9. $3e^{2x} + 2 = 17$

$$3e^{2x} = 15$$

$$e^{2x} = 5$$

$$2x = \ln(5)$$

$$x = \frac{\ln(5)}{2}$$

$$\boxed{x = 0.805}$$

10. $\log_4(x+2) + \log_4(2) = \log_4(16)$

$$\log_4(2x+4) = \log_4(16)$$

$$2x+4 = 16$$

$$2x = 12$$

$$\boxed{x = 6}$$

11. $25^{3x} = 125^{x+4}$

$$5^{2(3x)} = 5^{3(x+4)}$$

$$6x = 3x + 12$$

$$3x = 12$$

$$\boxed{x = 4}$$

12. $2 \ln(x+3) + 1 = 13$

$$2 \ln(x+3) = 12$$

$$\ln(x+3) = 6$$

$$e^6 = x+3$$

$$x = e^6 - 3$$

$$\boxed{x = 400.43}$$

13. $7 \log_x(27) - 6 = 15$

$$7 \log_x(27) = 21$$

$$\log_x(27) = 3$$

$$x^3 = 27$$

$$\boxed{x = 3}$$

14. $\log_7(x-5) + \log_7(3) = \log_7(8x)$

$$\log_7(3x-15) = \log_7(8x)$$

$$3x-15 = 8x$$

$$-15 = 5x$$

$$\cancel{\boxed{x = -3}}$$

$$\boxed{\{\emptyset\}}$$

15. $\frac{1}{2}e^{x-5} = 42$

$$e^{x-5} = 84$$

$$x-5 = \ln(84)$$

$$x = \ln(84) + 5$$

$$\boxed{x = 9.43}$$

16. $3^{2x} = 81^{x-1}$

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

$2x = 4x - 4$

$-2x = -4$

$x = 2$

17. $8^x = 16$

$8^x = 8^2$

$x = 2$

18. $2 \log_2(x+3) = 8$

$\log_2(x+3) = 4$

$2^4 = x+3$

$16 = x+3$

$x = 13$

19. $\log_3 4x - \log_3 7 = \log_3 10$

$\frac{4x}{7} = \frac{10}{1}$

$70 = 4x$

$x = 17.5$

20. $4 \ln x = 48$

$\ln x = 12$

$e^{12} = x$

$x = 162,754.79$

21. $\log_7(3x-5) = \log_7 2x + \log_7 4$

$\log_7(3x-5) = \log_7(8x)$

$3x-5 = 8x$

$-5 = 5x$

$\{\emptyset\}$

~~$x = -1$~~

22. $\ln x^2 = \ln(3x+28)$

$x^2 = 3x+28$

$x^2 - 3x - 28 = 0$

$(x-7)(x+4) = 0$

~~$x = -4$~~
 $x = 7$ ✓

23. $\log_3 5 + \log_3(x-7) = 2$

$\log_3(5x-35) = 2$

$3^2 = 5x-35$

$9 = 5x-35$

$44 = 5x$

$x = 8.8$

24. Ms. McNally loves animals! She starts with 2 cats and her cat family quadruples in size each year.

a. Write an function to model this situation.

$y = 2(4)^x$

b. After how many years will Ms. McNally have at least 35 cats?

$35 = 2(4)^x$

$17.5 = (4)^x$

$x = \log_4(17.5)$

$x \approx 2.065$ years

25. Mrs. McGeorge and Mr. Gaston love to compete. Mrs. McGeorge thinks she can earn more money at her bank than Mr. Gaston. She invests \$2100 earning 2.7% interest compounded annually. Mr. Gaston invests \$1500 at his bank earning 6% interest compounded annually. Who will be the first to have \$3000 saved?

(M) $3000 = 2100 \left(1 + \frac{0.027}{1}\right)^{1 \cdot x}$
 $1.42857 = (1.027)^x$
 $x = \log_{1.027}(1.42857) \approx 13.39$
years
LOSER

(G) $3000 = 1500 \left(1 + \frac{0.06}{1}\right)^{1 \cdot x}$
 $2 = (1.06)^x$
 $x = \log_{1.06}(2) \approx 11.89$
years
WINNER

26. Pauli invests \$4000 in a savings account that pays 4% compounded monthly.

a. Write an equation to find the principal after t years.

b. How much will he have after 18 months? (Hint: How many years is 18 months?) $t = 18/12 = 1.5$

c. How many months will it take him to save \$7000?

$$a) A = 4000 \left(1 + \frac{0.04}{12}\right)^{12t} \checkmark$$

$$b) A = 4000 \left(1 + \frac{0.04}{12}\right)^{(12 \cdot 1.5)} \approx \underline{\$4,246.92}$$

$$c) 7000 = 4000 \left(1 + \frac{0.04}{12}\right)^{12t} \rightarrow t \approx \underline{14 \text{ years}}$$

27. A bacteria sample contains 46 cells and the number of bacteria double every hour.

a. Write a function to find the number of bacteria after t months.

b. How many bacteria are there after 10 hours?

$$y = 46(2)^t$$

$$y = 46(2)^{10} = \underline{47,104 \text{ bacteria}}$$

28. Julie invests \$15,000 in a bond pays an annual rate of 6.5% interest compounded continuously. Write a function to find the value after t years.

$$A = 15000 e^{(0.065 \cdot t)} \rightarrow \underline{A = 15000 e^{0.065t}} \checkmark$$

29. An antique car is worth \$75,000 and appreciates at a rate of 7% each year. Write a function to model the value of the car after t years.

$$A = 75000(1 + 0.07)^t \rightarrow \underline{A = 75000(1.07)^t} \checkmark$$

30. A 2000mg sample of carbon has a half life of 200 years. Write function to model the amount remaining after t years. How much of the sample remains after 300 years.

$$a) \underline{A = 2000 \left(\frac{1}{2}\right)^{t/200}} \checkmark$$

$$b) A = 2000 \left(\frac{1}{2}\right)^{(300/200)} \approx \underline{707.11 \text{ mg}}$$

Evaluate the following.

31. $\log_2 7$

$$\frac{\log 7}{\log 2} \approx \underline{2.81}$$

32. $\ln e^1 = \underline{1}$

33. $\log_3 \frac{1}{9} = x$

$$3^x = \frac{1}{9}$$

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

$$\underline{x = -2}$$

34. $2^{\log_2 12} = \underline{12}$