

Key

1. Given the graph of  $f(x)$ , what transformations are required to graph  $-f(2x)$ ?

- a) Reflect over the x axis and stretch vertically by 2
- b) Reflect over the y axis and stretch horizontally by 2
- c) Reflect over the x axis and stretch <sup>horizontally</sup> ~~vertically~~ by  $1/2$
- d) Reflect over the y axis and stretch horizontally by  $1/2$

↑ ↑ inside argument = horizontal  
 reflect over x  
 $2 \rightarrow \frac{1}{2} < 1$  horiz. so compression by  $1/2$

$3 \cdot f(x) \rightarrow$  vert. stretch by 3

2. Inverse functions are reflections of each other in which line?

- a) The x axis
- b) the y axis
- c)  $y = x$
- d)  $y = -x$

3. Which of the following is the translation of the function  $f(x) = x^2$  right 3 units, down 5 units?

- a)  $f(x) = (x+3)^2 - 5$
- b)  $f(x) = (x-5)^2 - 3$
- c)  $f(x) = (x+3)^2 - 3$
- d)  $f(x) = (x-3)^2 - 5$

4. Find the domain and range of the function  $y = \sqrt{x+4} - 12$ .  $\rightarrow$  left 4, down 12

- a)  $x > -4, y > -12$
- b)  $x \geq -4, y \geq -12$
- c) all reals,  $y \geq -12$
- d)  $x \geq -4$ , all reals

5. Find the inverse of the following function.  $y = 2x - 7$

- a)  $y = \frac{1}{2}x + \frac{7}{2}$
- b)  $y = \frac{1}{2}x + 7$
- c)  $\frac{y-7}{2} = x$
- d)  $y = 2x + 7$

switch x & y

$x+4=0$

$x = 2y - 7$   
 $+7$   
 $\frac{x+7}{2} = \frac{2y}{2}$   
 $y = \frac{1}{2}x + \frac{7}{2}$

6. The function  $y = x^2$  is a(n) \_\_\_\_\_ function.

- a) odd
- b) reciprocal
- c) even
- d) one to one

$x^3, \sqrt[3]{x}$

$\frac{1}{x}$

$\text{symm. w/ y-axis!}$

$\text{fails HLT}$

$\text{fails HLT}$

7. Find  $g(f(-4))$  given  $f(x) = |x-3|$  and  $g(x) = x^2 - x$

- a) 53
- b) 42
- c) 56
- d) -15

$g(|-4-3|)$

$g(7) = 7^2 - 7 = 49 - 7$

$= 42$

8. Using the quadratic formula solve the following quadratic:  $x^2 - 6x = -13$

- a)  $3 \pm 2i$
- b)  $3 \pm 2$
- c)  $3 \pm 3\sqrt{22}$
- d) no solutions

$x^2 - 6x + 13 = 0$

imag. soln.

9. Evaluate  $\sqrt{-75}$ .

- a)  $5\sqrt{3}$
- b)  $25i\sqrt{3}$
- c)  $5i\sqrt{3}$
- d)  $5\sqrt{5i}$

$\sqrt{75}$   
 $\sqrt{25 \cdot 3}$

10. Which of the following is a factor of  $x^2 - 4x + 4$ .

- a)  $(x+2)$
- b)  $(x-2)$
- c)  $(x+1)$
- d)  $(x-1)$

$(x-2)(x-2)$

$$l = 2w + 10$$

$$l = 10 + 2w$$

11. A garden has a length that is 10 feet longer than twice its width. The area of the garden is 450 ft<sup>2</sup>. Write and equation to find the area of the garden.

- a)  $(x)(2x - 10) = 450$     b)  $(x)(x + 10) = 450$     c)  $(x)(2x + 10) = 450$     d)  $(x) + (2x + 10) = 450$

12. Using the quadratic formula solve the following quadratic:  $2x^2 - 3x + 5 = 0$

- a)  $\frac{3 \pm 7i}{4}$     b)  $\frac{3 \pm i\sqrt{31}}{4}$     c)  $\frac{-3 \pm \sqrt{-31}}{4}$     d)  $\frac{5i}{2}, -i$

$a = 2, b = -3, c = 5$

$$x = \frac{3 \pm \sqrt{(-3)^2 - 4(2)(5)}}{2(2)} = \frac{3 \pm i\sqrt{31}}{4}$$

$$V = l \cdot w \cdot h$$

13. The volume of a rectangular prism is modeled with the function  $V(x) = 2x^3 + x^2 - 13x + 6$ . The prism has a height of  $(x-2)$ . Find one possible solution set for the length and width of the prism.

- a)  $(2x-1)(x+3)$     b)  $(2x+1)(x-3)$     c)  $(x-1)(x+3)$     d)  $(x-2)(x+3)$

$$\begin{array}{r} 2 \overline{) 2 \quad 1 \quad -13 \quad 6} \\ \underline{+4 \quad +10 \quad -6} \\ 2 \quad 5 \quad -3 \quad 0 \end{array}$$

14. If two roots of a polynomial function are -4 and  $2+3i$ , which of the following are also roots?

- a) 4 and  $-2-3i$     b)  $-2-3i$     c) 4    d)  $2-3i$

→ switch middle sign  
→ conjugate →  $2-3i$

$$2x^2 + 5x - 3$$

15. Suppose  $P(x) = 3x^3 - 2x^2 + x + 4$  and  $Q(x) = x - 2$ . Find the value of the remainder,  $R(x)$ .

- a) -13    b) 22    c) -8    d) -30

16. What is the degree, the y intercept and the direction on the right for the following function:  $y = 2x^3 - 3x^2 + 5$

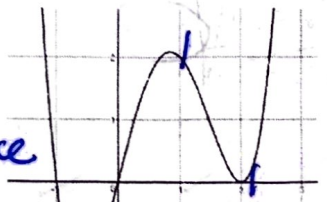
- a) 3, 5, down    b) 5, 5, up    c) 5, 5, down    d) 3, 5, up

17. Find  $R(x)$  given  $P(x) = 4x^4 - 5x^2 + 2x + 4$  and one root is  $(x+1)$

- a) -4    b) 4    c) 1    d) 8

18. What is the equation of the graph to the right?

- a)  $y = x^2(x-2)^2(x+1)$     c)  $y = x(x+2)^2(x-1)$   
b)  $y = (x-2)^2(x+1)^2$     d)  $y = x(x-2)^2(x+1)$



→ bounce  
degree 4  
3 turns + 1 = 4 = degree

19. A company needs to design a box for packaging a new product that has a volume of 200 m<sup>3</sup>. The packaging requires that the width be 10 m shorter than the length and the height be 20 m longer than the length. To the nearest tenth, find the length of the box.

- a) 0.9 cm    b) 5.3 cm    c) 10.6 cm    d) 8.3 cm

$$w = l - 10$$

$$h = l + 20$$

$$V = l(l-10)(l+20) = 200$$

20. Solve.  $|2x - 8| = 12$

$2x - 8 = 12$   
 $2x = 20$   
 $x = 10$

$2x - 8 = -12$   
 $2x = -4$   
 $x = -2$

- a)  $x = 10$    b)  $x = -2$    c)  $x = 2$  or  $x = -10$    d)  $x = -2$  <sup>OR</sup>  $x = 10$

21. Solve:  $|2x - 8| \leq 18$

- a)  $x \geq -5$  or  $x \leq 13$    b)  $x \leq -5$  and  $x \geq 13$    c)  $-5 \leq x \leq 13$    d)  $-5 < x < 13$

22. Solve:  $|x - 8| - 6 > 20$

$|x - 8| > 26$

$x - 8 > 26$   
 $+8 \quad +8$   
 $x > 34$

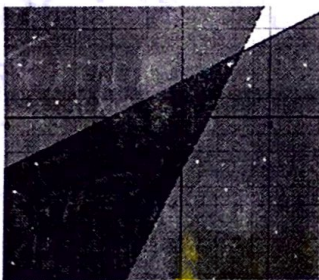
$x - 8 < -26$   
 $+8 \quad +8$   
 $x < -18$

- a)  $x \leq -18$  or  $x \geq 34$    b)  $x < -18$  and  $x > 34$    c)  $-18 < x < 34$    d)  $-18 \leq x \leq 34$

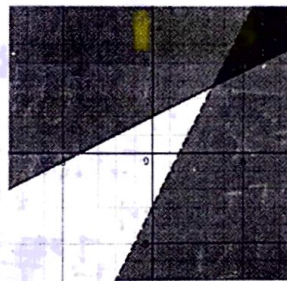
23. Solve the following system of inequalities.  $y > 2x - 3$

$y \leq \frac{1}{2}x + 2$

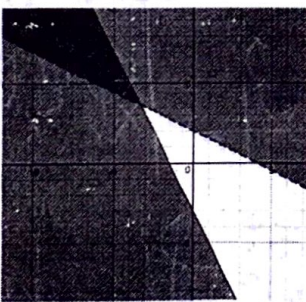
a)



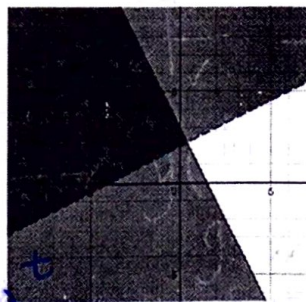
b)



c)



d)



$A = 505(1 + .23)^x$

24. An initial population of 505 quail increases at an annual rate of 23%. Write an exponential function to model the quail population.

- a)  $f(x) = 505(1.23)^x$    b)  $f(x) = 505(23)^x$    c)  $f(x) = 505(0.23)^x$    d)  $f(x) = (505 - 0.23)^x$

25. Suppose you invest \$1600 at an annual interest rate of 4.6% compounded continuously. How much will you have in the account after 4 years?

- a) \$10,138.07   b) \$800.26   c) \$6,701.28   d) \$1,923.23

26. How much money invested at 5% compounded continuously for 3 years will yield \$820?

- a) \$952.70   b) \$780.01   c) \$705.78   d) \$818.84

$A = Pe^{rt}$   
 $A = 1600e^{.046(4)}$   
 $820 = P(e^{.05(3)})$   
 $\frac{820}{1.16} = \frac{P(1.16)}{1.16}$

$820 = P(e^{.05(3)})$

$\frac{820}{1.16} = \frac{P(1.16)}{1.16}$

Write the equation in logarithmic form.

27.  $6^4 = 1,296$

- a)  $\log_4 1,296 = 6$     b)  $\log 1,296 = 4$     c)  $\log_5 1,296 = 4$     d)  $\log 1,296 = 4 \cdot 6$

exp.  
↓

Evaluate the logarithm.

28.  $\log_5 \frac{1}{625}$

$\frac{\log(1/625)}{\log 5}$

- a) 5    b) -4    c) 4    d) -3

29.  $\log_3 243$

$(\log 243) / \log 3$

- a) 5    b) 3    c) 4    d) -5

Write the expression as a single logarithm.

30.  $4 \log x - 6 \log(x+2)$

- a)  $\log x(x-2)^{24}$     b)  $24 \log \frac{x}{x+2}$     c)  $\log x^4(x+2)^6$     d) none of these

31. Use the properties of logarithms to evaluate  $\log_3 9 + \log_3 36 - \log_3 4$ .

- a) 41    b) 4    c) 2    d) 8

$\log_3 \left( \frac{9 \cdot 36}{4} \right)$

32. Solve  $\frac{1}{16} = 64^{4x-3}$ .

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

- a)  $\frac{11}{12}$     b)  $\frac{1}{4}$     c)  $\frac{7}{12}$     d)  $\frac{1}{12}$

$\frac{1}{4^2} = \frac{1}{16}$

33. Solve  $\log(4x+10) = 3$ .

- a)  $\frac{7}{4}$     b) 990    c) 250

$10^3 = 4x + 10$   
 $1000 = 4x + 10$   
 $990 = 4x$

34. Solve  $\log 3x + \log 9 = 0$ . Round to the nearest hundredth if necessary.

- a) 0.04    b) 3    c) 0.33    d) 27

$247.5 = x = 495$

35. Solve  $\log(x+9) - \log x = 3$ .

- a) 3.2222    b) 111    c) 0.0090    d) 0.3103

$\log(3x \cdot 9) = 3$

36. Solve  $2 \log 4 - \log 3 + 2 \log x - 4 = 0$ .

- a) 43.3013    b) 1875    c) 86.6025    d) 12.3308

Write the expression as a single natural logarithm.

37.  $3 \ln 3 + 3 \ln c$

- a)  $\ln 27c$     b)  $\ln(27 + c^3)$     c)  $\ln 9c^3$     d)  $\ln 27c^3$

$\ln 3^3 \cdot c^3 = \ln 27c^3$

38.  $3 \ln x - 2 \ln c$

- a)  $\ln x^3 c^2$     b)  $\ln \frac{x^3}{c^2}$     c)  $\ln(x^3 - c^2)$     d)  $\ln(x^3 + c^2)$

$= \ln(x^3/c^2)$

39. Solve  $\ln(2x-1) = 8$ . Round to the nearest thousandth.

- a) 1,490.979    b) 2,979.958    c) 1,489.979    d) 2,981.458

$e^8 = 2x-1$

40. Solve  $\ln 2 + \ln x = 5$ .

- a) 3    b) 50,000    c) 74.2    d) 10

$\ln 2x = 5$   
 $2980.96 = 2x-1$

41. Solve  $\ln x - \ln 6 = 0$ .

- a) 6e    b)  $e^5$     c) 6    d)  $\ln 6$

$\ln \left( \frac{x}{6} \right) = 0$  |  $e^0 = \frac{x}{6}$  |  $1 = \frac{x}{6}$  |  $x = 6$

$10^0 = 27x$   
 $1 = 27x$   
 $\frac{1}{27} = x$   
 $\log_{10} \frac{x+9}{x} = 3$   
 $x \cdot 10^3 = \frac{x+9}{x} \cdot x$   
 $1000x = x+9$   
 $999x = 9$   
 $x = \frac{1}{111} = .009$

Use natural logarithms to solve the equation. Round to the nearest thousandth.

42.  $6e^{4x} - 2 = 3$   
 a) 0.067

$\rightarrow \frac{6e^{4x}}{6} = \frac{5}{6} / e^{4x} = \frac{5}{6} / \ln e \frac{5}{6} = 4x | -\frac{0.1823}{4} = \frac{4x}{4}$   
 b) -0.448  
 c) -0.046 = x  
 d) 0.327

43. The amount of money in an account with continuously compounded interest is given by the formula  $A = Pe^{rt}$ , where  $P$  is the principal,  $r$  is the annual interest rate, and  $t$  is the time in years. Calculate to the nearest hundredth of a year how long it takes for an amount of money to double if interest is compounded continuously at 6.2%. Round to the nearest tenth.

a) 1.1 yr

b) 11.2 yr

c) 6.9 yr

d) 0.6 yr

$P = \$1 \rightarrow \$2 = A$

$2 = 1e^{.062t}$

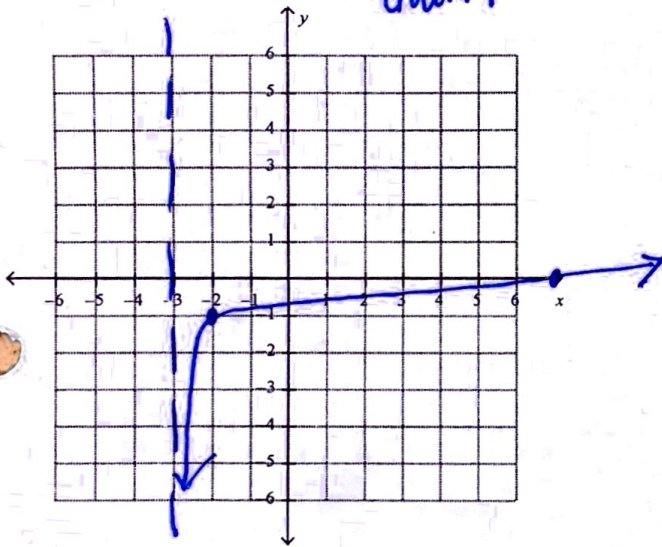
$\ln e^2 = .062t \rightarrow \frac{.693}{.062} = \frac{.062t}{.062}$   
 right 3  
 down 1

$t = 11.2$

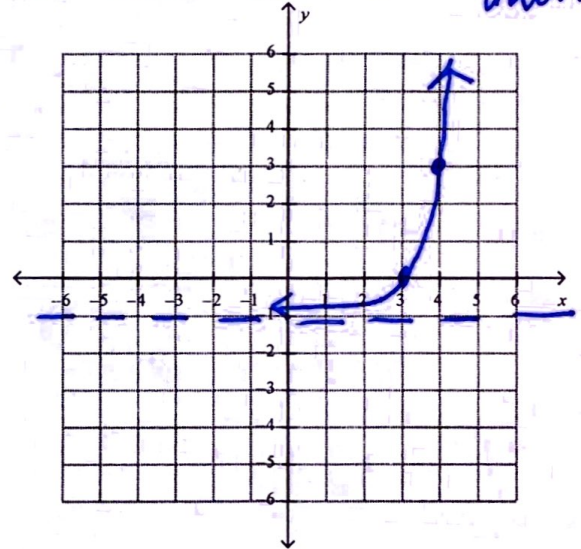
Graph the logarithmic equation.

44.  $y = \log(x + 3) - 1$

calc  
left 3  
down 1

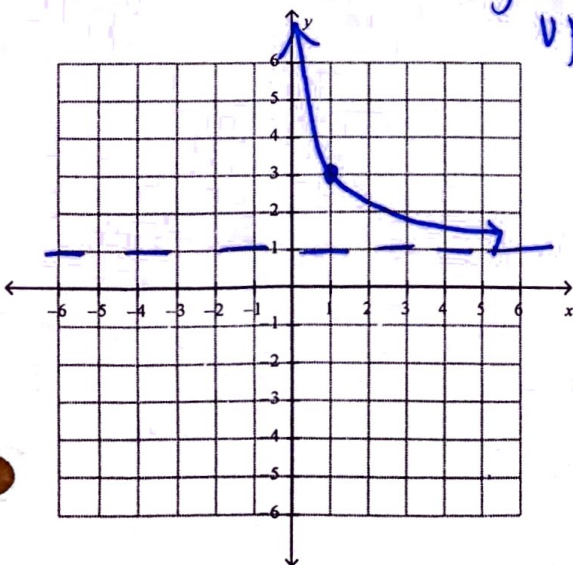


45. Graph  $y = (4)^{x-3} - 1$ .



46. Graph  $y = 2\left(\frac{1}{5}\right)^{x-1} + 1$ .

v.s. by 2  
right 1  
up 1



47. Graph  $f(x) = \begin{cases} -2x - 1 & x < 2 \\ x^2 - 6x + 7 & x \geq 2 \end{cases}$

