

DO NOT WRITE ON THIS TEST!!!

Compounding Interest

$$y = a(1+r)^t$$

$$y = a(1-r)^t$$

$$y = Pe^{rt}$$

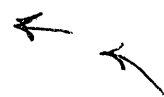
Logarithmic Properties

$$\log_a b = c \leftrightarrow a^c = b$$

$$\log_a (x \cdot y) = \log_a x + \log_a y$$

$$\log_a \left(\frac{x}{y}\right) = \log_a x - \log_a y$$

$$\log_a x^z = z \cdot \log_a x$$



1. An exponential function is a decay function if

- (A) The base is < 1 B) The base is > 1 C) The exponent is < 1 D) The exponent is > 1 ↑

2. What log base does your calculator use?

- A) 1 B) 5 (C) 10 D) 100 ↑

don't forget it has base e also (LN)

3. According to the Product Rule; when you condense logs, addition turns into

- A) Addition B) subtraction (C) multiplication D) it doesn't change ↑

LOOK ON TOP ↑

4. What base exponent would you use to solve this equation? $8^{2x-1} = 32^{x+2}$

- A) 2 B) 7 C) 5 D) 23

$(2^3)^{2x-1} = (2^5)^{x+2}$
Make prime factor tree

5. If you deposit \$10,000 in an account that pays 7.8% interest compounded annually, how much will your balance be after 9 years?

- A) \$12,236.78 B) \$57,735.34 C) \$12,283.97 (D) \$19,659.33

$$y = 10,000(1 + 0.078)^9$$

6. If you deposit \$4000 in an account that compounds **continuously** with an interest rate of 3%, how long will it take for your balance to be \$10,000?

- ~~A) 0.231 years B) 2.31 years C) 23.1 years D) 231 years~~

↑ use pe^{rt} formula!
use tables on your calculator
 $y = 4000e^{.03x}$
ANSWER between 30 + 31 years

7. Expand the logarithm: $\log \frac{4x^7}{y^5}$

$$\log 4 + 7 \log x - 5 \log y$$

8. Solve for x: $\log_5(x+6) = 3$

- A) $x = 4$ B) $x = 8$ (C) $x = 119$ D) $x = 2$

BOB

$$5^3 = x + 6$$

$$125 = x + 6$$

$$119 = x$$

9. Solve for x: $2^{x+3} = 8^x$

- A) $x = -3$ B) $x = 3$ (C) $x = 1.5$ D) $x = -6$

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

$$x + 3 = 3x$$

$$3 = 2x \rightarrow x = \frac{3}{2}$$

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10. Solve for x: $\log(2x+3) = \log(x+5)$

$2x+3 = x+5$
 $x+3 = 5$
 $x = 2$

- A) $x = 2$ B) $x = -\frac{3}{2}$ C) $x = -5$ D) $x = 0$

11. Solve for x: $\log_5 3x = \log_5(x+7)$

$3x = x+7$
 $2x = 7$
 $x = \frac{7}{2}$

- A) $x = \frac{7}{3}$ B) $x = -3$ C) $x = 3$ D) $x = \frac{7}{2}$

12. Solve for x: $25^{4x-7} = 125$

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

$5^{8x-14} = 5^3$

$8x - 14 = 3$
 $8x = 17$
 $x = \frac{17}{8}$

- A) $\frac{7}{4}$ B) $\frac{17}{8}$ C) $\frac{5}{2}$ D) 3

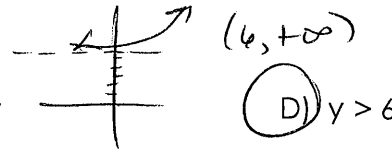
13. Write the logarithmic form of: $4^3 = 64$

$\log = \text{exp}$
 \uparrow base

$\log_4 64 = 3$
 base \rightarrow

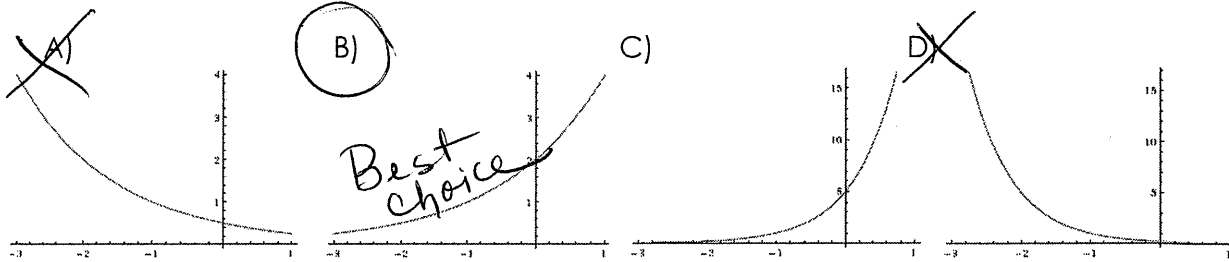
- A) $\log_4 3 = 64$ B) $\log_3 4 = 64$ C) $\log_{64} 3 = 4$ D) $\log_4 64 = 3$

14. What is the range of the function $f(x) = 2^{x+6}$?



- A) all x B) $x > 6$ C) all y D) $y > 6$

15. Which graph represents the function $f(x) = 2^x + 1$



16. Which equation represents an exponential decay function?

- A) $f(x) = -2 \cdot 4^x$ B) $f(x) = \frac{1}{2} \cdot 3^{x-4}$ C) $f(x) = \left(\frac{2}{3}\right)^x$ D) $f(x) = \left(\frac{5}{3}\right)^x$
- \uparrow base < 1

17. The value of a home since its purchase can be modeled by the equation $V = 195,000(1.06)^t$, where t is the number of years since its purchase. By what percentage is the value of the home increasing?

- A) .06% B) 1.06% C) .6% D) 6%

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18. A colony of termites has a population of 800 and increases by 11% each year. Which is the equation that represents the population of the termite colony after y years?

- A) $P = 1.11(800)^y$ B) $P = 800(11)^y$ C) $P = 11(800)^y$ **D) $P = 800(1.11)^y$**

19. Simplify completely. $\sqrt{45} + 4\sqrt{5}$

$\frac{\sqrt{9 \cdot 5}}{3\sqrt{5}} + 4\sqrt{5}$

- A) $13\sqrt{5}$ B) $5\sqrt{50}$ C) $4\sqrt{50}$ **D) $7\sqrt{5}$**

20. Simplify completely. $\sqrt{12} - 3\sqrt{75}$

$\frac{\sqrt{4 \cdot 3}}{2\sqrt{3}} - 3\sqrt{25 \cdot 3}$
 $\frac{1}{\sqrt{3}} - 15\sqrt{3}$

- A) $-6\sqrt{3}$ B) $17\sqrt{3}$ **C) $-13\sqrt{3}$** D) Cannot be simplified

21. Solve. $\sqrt{y-3} - 6 = -4$

$\sqrt{y-3} = 2$
 $y-3 = 4$
 $y = 7$

- A) -7 **B) 7** C) 5 D) -5

22. Use $g(x) = 5x - 1$ $h(x) = 3x^2 + 7$

Which set of function operations would give us an answer of $15x^3 - 3x^2 + 35x - 7$?

- A) $g(x) \cdot h(x)$** B) $g(x) - h(x)$ C) $g(x) + h(x)$ D. none

23. Simplify $\sqrt{36x^5}$

$\sqrt{6 \cdot 6 \cdot x \cdot x \cdot x \cdot x \cdot x}$
 $6x^2\sqrt{x}$

24. Use $g(x) = 5x - 1$ $h(x) = 3x^2 + 7$

Which set of function operations would give us an answer of $5x - 13$?

- ~~A) $g(x) \cdot h(x)$~~ ~~B) $g(x) - h(x)$~~ ~~C) $g(x) + h(x)$~~ **D. none**

25. _____ 2. To solve the equation, $\sqrt[3]{x} = 56$ the first step would be to?

- A. Put an exponent of 3 on both sides **C. Divide both sides by 8**
B. Subtract 3 from both sides D. This equation cannot be solved

26. Use $g(x) = 5x - 1$ $h(x) = 3x^2 + 7$

$g(h(3))$ FIND $h(3)$ first

$3(3)^2 + 7$
 $3(9) + 7$
 $27 + 7$
 34

Now find

$g(34) = 5(34) - 1$
 $170 - 1$
169

DO NOT WRITE ON THIS TEST!!!27. Use $g(x)=5x-1$ $h(x)=3x^2+7$ $g(4)+h(4)$

$$g(4) = 5(4) - 1$$

19

+

$$h(4) = 3(4)^2 + 7$$

$$= 3(16) + 7$$

$$= 55$$

=

74

28. What is the transformation for $f(x) = \log_2(x+1) - 2$ is:

A. up one, right 2

B. left one, down 2

C. right one, down 2

D. reflect over y

↑ opposite!

29. The range of $f(x) = \log_2(x+1) - 2$ is:A. $(-\infty, 1)$ B. $(-1, \infty)$ C. $(-2, \infty)$

D. All Real Numbers

30. Exponential graphs have horizontal asymptotesLogarithmic graphs have vertical asymptotes

Practice Final Exam A

Date _____

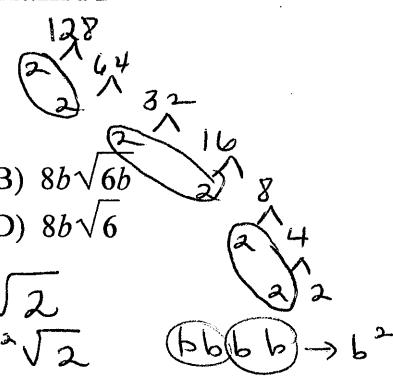
Simplify.

1) $\sqrt{128b^4}$

- A) $8b^2\sqrt{2}$
- C) $4b\sqrt{2b}$

- B) $8b\sqrt{6b}$
- D) $8b\sqrt{6}$

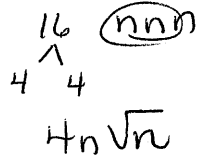
$2^3\sqrt{2}$
 $\therefore 8b^2\sqrt{2}$



2) $\sqrt{16n^3}$

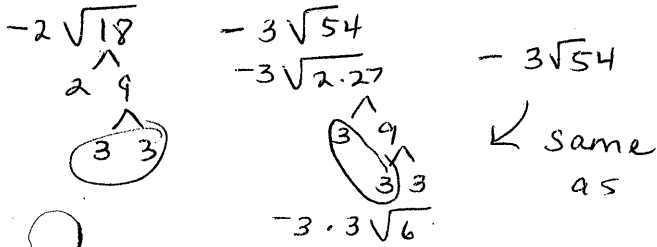
- A) $2n^2\sqrt{5}$
- C) $4n\sqrt{n}$

- B) $16n^2$
- D) $3\sqrt{7n}$



3) $-2\sqrt{18} - 3\sqrt{54} - 3\sqrt{54}$

- A) $-6\sqrt{2} - 36\sqrt{6}$
- B) $-6\sqrt{2} - 27\sqrt{6}$
- C) $-6\sqrt{2} - 18\sqrt{6}$
- D) $-12\sqrt{2} - 27\sqrt{6}$



$-2 \cdot 3\sqrt{2} = -6\sqrt{2}$
 $-3 \cdot 3\sqrt{6} = -9\sqrt{6}$
 $-3 \cdot 3\sqrt{6} = -9\sqrt{6}$
 $\rightarrow -6\sqrt{2} - 18\sqrt{6}$

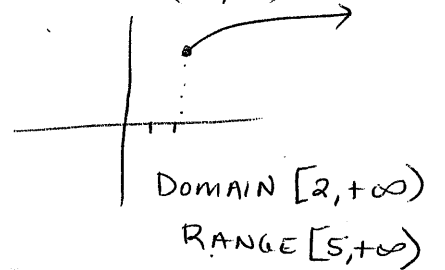
Identify the domain and range of each.

4) $y = \sqrt{x-2} + 5$

- A) Domain: $x \geq 2$
Range: $y \geq -5$
- B) Domain: $x \geq 2$
Range: $y \geq 5$
- C) Domain: $x \geq -5$
Range: $y \geq -2$
- D) Domain: $x \geq 5$
Range: $y \geq -2$

FIND VERTEX

$x-2=0$
 $x=2, y=5$
 $(2, 5)$



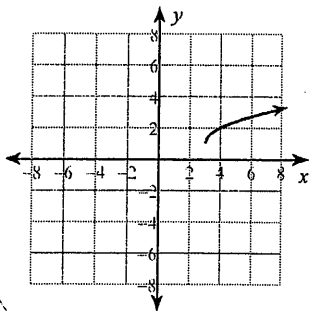
Sketch the graph of each function.

5) $y = \sqrt{x+3} + 1$

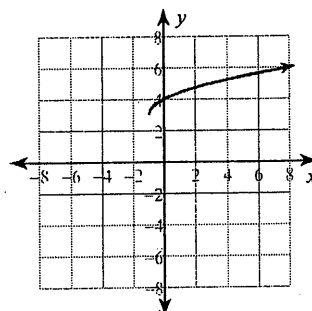
vertex:

$x+3=0$
 $x=-3$
 $y=1$
 $(-3, 1)$

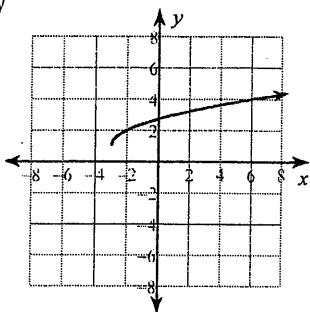
A)



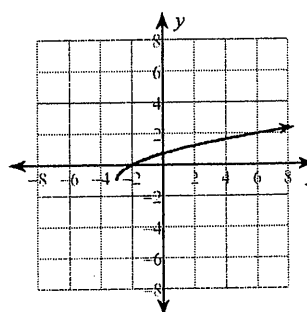
C)



B)



D)



Solve each equation. Remember to check for extraneous solutions.

6) $\sqrt{17-a} = \sqrt{a+1}$

- A) {3} B) {7, 3}
 C) {7, -3} **D) {8}**

$17-a = a+1$

$17 = 2a+1$
 $16 = 2a$
 $a = 8$

7) $16 = \sqrt{1-10n} + 7$

- A) {-8}** B) {3}
 C) {-7} D) {8}

$9 = \sqrt{1-10n}$

$81 = 1-10n$
 $80 = -10n$
 $-8 = n$

Solve each equation.

8) $(p-20)^{\frac{5}{3}} - 1 = 242$

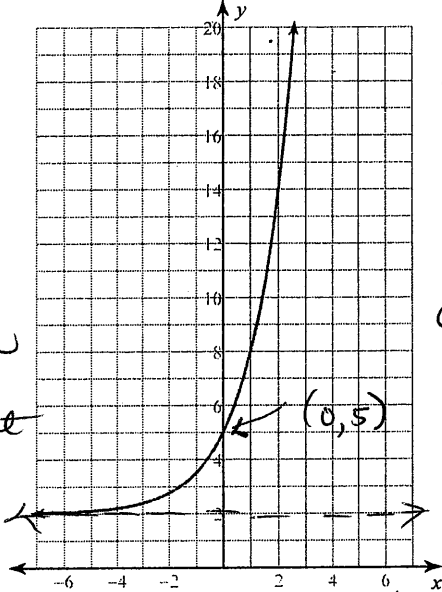
- A) {47, 2} **B) {47}**
 C) {47, -9} D) {2}

$(p-20)^{\frac{5}{3}} = 243$

$p-20 = 243^{\frac{3}{5}}$
 $p-20 = 27$
 $p = 47$

Write an equation for each graph.

9)



A) $y = 2 \cdot 3^x + 2$
 $y = 2 \cdot 1 + 2$
 $y = 2 + 2$
 $y = 4$
 C) $y = 3 \cdot 2^x + 2$
 $y = 3 \cdot 1 + 2$
 $y = 3 + 2$
 $y = 5$

horizontal asymptote $y = 2$ is

- A) $y = 2 \cdot 3^x + 2$
~~B) $y = 4 \cdot 2^{x-2}$~~
C) $y = 3 \cdot 2^x + 2$
~~D) $y = 4 \cdot 2^x - 2$~~

Graph has y-intercept at (0, 5)
 - Start by comparing those 2 points

CAREFUL! QUESTIONS OUT OF ORDER

Solve each equation.

11) $6^{-n-1} = 1$

- A) {-9} B) {-3}
C) {-1} D) {-10}

$6^{-n-1} = 6^0$

$-n-1 = 0$
 $-n = 1$
 $n = -1$

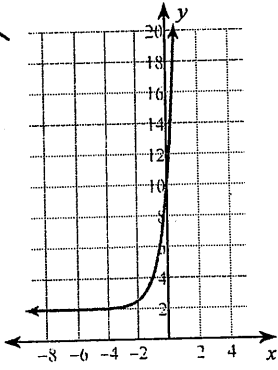
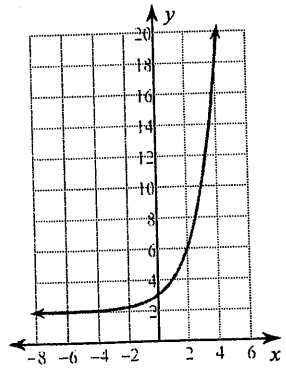
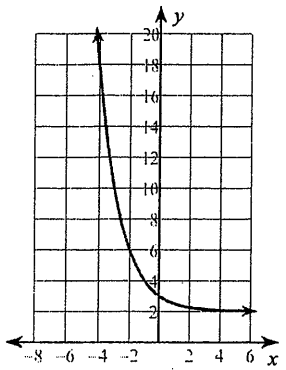
1 can be rewritten as any base with an exponent of zero

Sketch the graph of each function.

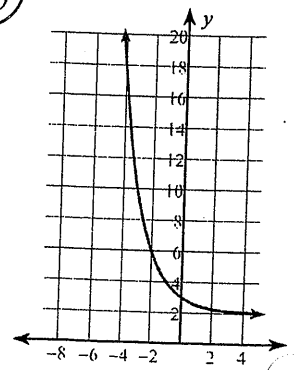
10) $y = 2 \cdot \left(\frac{1}{2}\right)^{x+1} + 2$

this is a decay function; find a graph that is DECREASING left to right

asymptote at $y = 2$



D)



A + D appear to be the same graphs?
 Verify other points on graph using x/y tables in calculator.

12) $16^{3n+1} = 64$ $(4^2)^{3n+1} = (4^3)$

A) $\{-\frac{7}{4}\}$

B) $\{\frac{1}{6}\}$

C) $\{4\}$

D) $\{-7\}$

$4^{6n+2} = 4^3$

$6n+2=3$

$6n=1$

$n = \frac{1}{6}$

13) $4^{k+3} = 32^{2k}$

A) $\{\frac{3}{4}\}$

B) $\{-\frac{3}{8}\}$

C) $\{4\}$

D) $\{\frac{7}{4}\}$

$(2^2)^{k+3} = (2^5)^{2k}$

$2^{2k+6} = 2^{10k}$

$2k+6=10k$

$6=8k$

$\frac{6}{8}=k$

$\frac{3}{4}=k$

14) $5^{k-1} = 5^2$

A) No solution.

B) $\{3\}$

$k-1=2$

C) $\{-2\}$

D) $\{-\frac{19}{10}\}$

$k=3$

Evaluate each function.

15) $w(t) = t^2 - t$; Find $w(3)$

A) 56

B) 30

C) $3^2 - 3$

D) 72

$9-3$

6

16) $g(a) = 4a + 5$; Find $g(-5)$

$4(-5) + 5$

A) -27

B) -11

C) -15

D) 33

$-20 + 5$

-15

Perform the indicated operation.

17) $g(x) = 3x - 4$

$(3x-4)(x^2+x)$

$f(x) = x^2 + x$

$3x^3 + 3x^2 - 4x^2 - 4x$

Find $(g \cdot f)(x)$

$3x^3 - x^2 - 4x$

A) $-2x^3 + 9x^2 + 5x$

B) $3x^3 - x^2 - 4x$

C) $-3x^4 + 6x^3 - 3x^2$

D) $-4x^4 - 2x^3 + 8x + 4$

18) $g(x) = x^2 - 1$

$(x^2-1) + (3x+4)$

$h(x) = 3x + 4$

Find $(g+h)(x)$

$x^2 + 3x + 3$

A) $-3x^3 - x + 1$

B) $x^2 - 3x + 3$

C) $x^2 + 4x - 3$

D) $x^2 + 3x + 3$

19) $g(x) = 4x + 3$

$4(4x+3) - 2(2x-2)$

$h(x) = 2x - 2$

$16x + 12 - 4x + 4$

Find $(4g-2h)(x)$

$12x + 16$

A) -14

B) $12x + 16$

C) $-24x + 6$

D) $6x + 20$

20) $g(x) = 2x - 5$

$h(x) = x^2 + 4$

Find $(g \circ h)(x)$

$2(x^2+4) - 5$

$2x^2 + 8 - 5$

$2x^2 + 3$

A) $4x^2 - 20x + 29$

B) $4x^2 + 20x + 29$

C) $2x^2 + 3$

D) $8x - 14$

21) $f(t) = t^2 + 3$

$(2t+3)^2 + 3$

$g(t) = 2t + 3$

Find $(f \circ g)(t)$

$(2t+3)(2t+3) + 3$

A) $4t^2 - 12t + 12$

B) $4t^2 + 12t + 12$

C) $4t^2 + 7$

D) $2t^2 + 9$

$4t^2 + 6t + 6t + 9 + 3$

$4t^2 + 12t + 12$

22) $f(x) = 2x^2 - 4$

$g(x) = 2x - 3$

Find $(f \circ g)(-2)$

Find $g(-2)$ first

$2(-2) - 3$

$-4 - 3$

-7

then find

$f(-7)$

$2(-7)^2 - 4$

$2(49) - 4$

$98 - 4$

94

23) $f(t) = t + 4$

$g(t) = 2t + 5$

Find $(f \circ g)(-1)$

Find $g(-1)$ first

$2(-1) + 5$

$-2 + 5$

3

Now find $f(3)$

$3 + 4$

7

A) 25

B) 11

C) 3

D) 7

Expand each logarithm.

24) $\log_8 \left(\frac{a^2}{b} \right)^5$ $\log_8 \frac{a^{10}}{b^5}$

- A) $2 \log_8 a + 5 \log_8 b$
- B) $10 \log_8 a - 5 \log_8 b$
- C) $10 \log_8 a + 5 \log_8 b$
- D) $5 \log_8 a - 10 \log_8 b$

25) $\log_3 (x \cdot y \cdot z^5)$ \log_3

- A) $20 \log_3 x + 4 \log_3 y$
- B) $\log_3 x + \log_3 y + 5 \log_3 z$
- C) $5 \log_3 x + 4 \log_3 y$
- D) $20 \log_3 x - 4 \log_3 y$

26) $\log \left(\frac{x^4}{y} \right)^4$ $\log \frac{x^{16}}{y^4}$

- A) $4 \log x - 4 \log y$
- B) $4 \log z + \frac{\log x}{2}$
- C) $16 \log x - 4 \log y$
- D) $\log z + \frac{\log x}{2} + \frac{\log y}{2}$

27) $\ln (2 \cdot 3^5)^5$ $\ln 2^5 \cdot 3^{25}$

- A) $5 \ln 2 + 25 \ln 3$
- B) $\ln 5 + \frac{\ln 2}{2} + \frac{\ln 3}{2}$
- C) $25 \ln 2 - 5 \ln 3$
- D) $5 \ln 2 + 5 \ln 3$

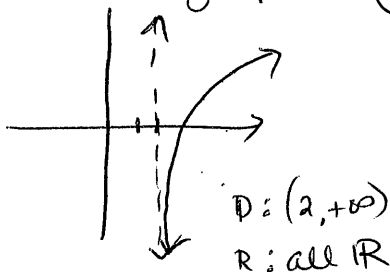
Identify the domain and range of each.

Log graphs have restricted domains.
The range is all \mathbb{R} .

28) $y = \log(x-2) - 4$

$x-2=0$

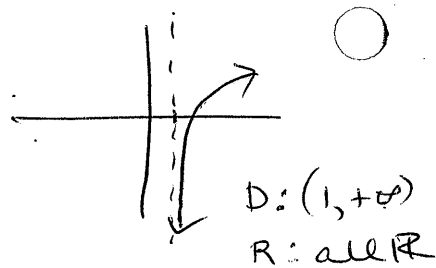
$x=2$ is
the vertical
a asymptote



- A) Domain: $x > -2$
Range: All reals
- B) Domain: $x > 2$
Range: All reals
- C) Domain: All reals
Range: $x > -2$
- D) Domain: All reals
Range: $x < -2$

29) $y = \log_4(x-1) - 3$

- A) Domain: $x < 1$
Range: All reals
- B) Domain: $x > 1$
Range: All reals
- C) Domain: $x > -1$
Range: All reals
- D) Domain: All reals
Range: $x > -1$



Solve each equation.

30) $\log_6(6-x) = \log_6(3x-10)$

- A) $\{-4\}$
- B) $\{4\}$
- C) No solution.
- D) $\{-1\}$

$6-x = 3x-10$
 $6 = 4x-10$
 $16 = 4x$
 $x = 4$

31) $\log_{14}(r+2) = \log_{14}(4r+4)$

- A) $\{-9\}$
- B) $\{-4\}$
- C) $\{12\}$
- D) $\left\{ \frac{2}{3} \right\}$

$r+2 = 4r+4$
 $2 = 3r+4$
 $-2 = 3r$
 $r = -\frac{2}{3}$

32) $\log_9 x - \log_9 7 = 1$

- A) $\left\{ \frac{7}{4} \right\}$
- B) $\{63\}$
- C) $\left\{ \frac{81}{7} \right\}$
- D) $\{18\}$

$\log_9 \frac{x}{7} = 1$
 $9^1 = \frac{x}{7}$
 $63 = x$

33) $\log_5 x + \log_5 8 = 2$

- A) $\left\{ \frac{43}{4} \right\}$
- B) $\left\{ \frac{25}{8} \right\}$
- C) $\left\{ \frac{25}{9} \right\}$
- D) $\{10\}$

$\log_5 x \cdot 8 = 2$
 $5^2 = 8x$
 $25 = 8x$
 $x = \frac{25}{8}$

Evaluate each expression.

34) $\log_{\frac{1}{3}} 216$

- A) -3
 B) 3
 C) -4
 D) 5

Put in calculator as $\frac{\log 216}{\log 3}$

35) $\log_3 81$

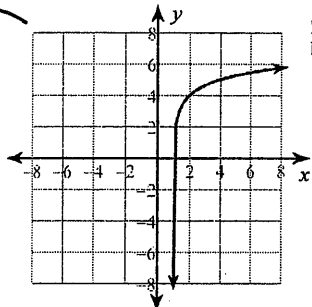
- A) 4
 B) 27
 C) 0
 D) -3

$\frac{\log 81}{\log 3}$

Identify the domain and range of each. Then sketch the graph.

36) $y = \log_3(x-1) - 4$

vertical asymptote at $x=1$



Domain: $x > 1$
 Range: All reals

Rewrite each equation in exponential form.

37) $\log_8 64 = 2$

$8^2 = 64$

- A) $2^{64} = 8$
 B) $64^2 = 8$
 C) $8^2 = 64$
 D) $2^8 = 64$

Rewrite each equation in logarithmic form.

38) $16^{-2} = \frac{1}{256}$

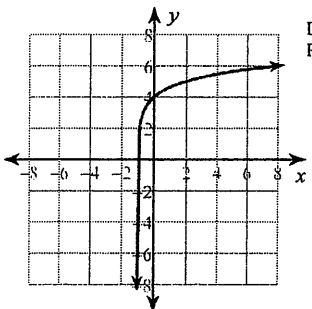
$\log_{16} \frac{1}{256} = -2$

A) $\log_{-2} \frac{1}{256} = 16$

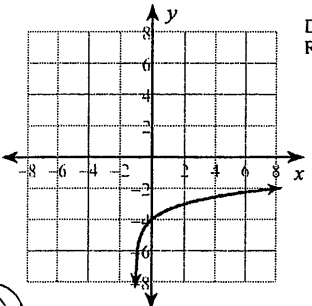
B) $\log_{\frac{1}{256}} -2 = 16$

C) $\log_{16} \frac{1}{256} = -2$

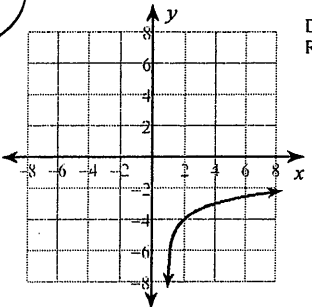
D) $\log_{-2} 16 = \frac{1}{256}$



Domain: $x > -1$
 Range: All reals



Domain: $x > -1$
 Range: All reals



Domain: $x > 1$
 Range: All reals

Let argument = base

$x-1 = 3$

$x = 4$

FIND y when $x=4$

$y = \log_3(4-1) - 4$

$\log_3(3) - 4$

$1 - 4$

-6

$(4, -3)$ is a point on the graph

