McG Key F'18

Honors Math III

Logarithms Review

Evaluate.

1. $log_2(-1)$ undefined

2. $log_2 \frac{1}{8} = x$ $x = -3$ $2^x = \frac{1}{8} = 2^{-3}$

3. $log_3 \frac{1}{9}$ $x = -2$ $3^x = \frac{1}{9}$

4. $log_7 4 = \frac{\log 4}{\log 7} = 0.7124$

5. Write $log_2 1024 = 10$ in exponential form. $2^{10} = 1024$

6. Write $25^{\frac{-1}{2}} = \frac{1}{5}$ in log form $\log_{25} \frac{1}{5} = -\frac{1}{2}$

Simplify:

7. $\frac{7^{\sqrt{3}+2}}{49} = \frac{7^{\sqrt{3}+2}}{7^2} = 7^{\sqrt{3}+2-2} = 7^{\sqrt{3}}$

8. $(\sqrt{3})^{\sqrt{2}}(\sqrt{3})^{-\sqrt{2}}$ ADD $= (\sqrt{3})^0 = 1$

9. $(25^{\frac{1}{2}} - 9^{\frac{1}{2}})^2$ $(5-3)^2$ $(2)^2 = 4$

Solve:

10. $4^{x-5} = \frac{1}{8}^{x+5}$ $(2^2)^{x-5} = (2^{-3})^{x+5}$ $2x-10 = -3x-15$ $5x = -5$ $x = -1$

11. $\frac{1}{3}\log_2(x+1) = 4 \cdot 3$ $\log_2(x+1) = 12$ $2^{12} = x+1$ $2^{12} - 1 = x = 4095$

12. $\frac{1}{2}\ln 4 - \ln x = \ln \frac{1}{8}$ $\ln 4^{1/2} - \ln x = \ln \frac{1}{8}$ $\ln \frac{2}{x} = \ln \frac{1}{8}$ $\frac{2}{x} = \frac{1}{8}$ $16 = x$

13. $\log_4 8 - \frac{1}{4}\log_4 x = -\log_4 2$ $\log_4 \frac{8}{x^{1/4}} = \log_4 2^{-1}$ $\frac{8}{x^{1/4}} = \frac{1}{2}$ $(x^{1/4})^4 = (16)^4$ $x = 16^4$ $x = 65{,}536$

14. $10^x = 4.3$ $\log_{10} 4.3 = x$ $x = 0.6335$

15. $3e^{-x} - 4 = 9$ $3e^{-x} = 13$ $e^{-x} = \frac{13}{3}$ $\ln_e \frac{13}{3} = -x$ $x = -\ln \frac{13}{3}$

16. $2\ln 9 - \frac{1}{3}\ln 27 = \ln x$ $\ln \frac{9^2}{27^{1/3}} = \ln x$ $\ln \frac{81}{3} = \ln x$ $27 = x$

17. $\frac{2\log_3 x}{2} = \frac{4}{2}$ $\log_3 x = 2$ $3^2 = x$ $9 = x$

18. $2^{3x+5} = \frac{1}{16}^{x}$ $2^{3x+5} = (2^{-4})^x$ $3x+5 = -4x$ $5 = -7x$ $-\frac{5}{7} = x$

19. $\frac{1}{2}\ln x - 3 = 4$

$2 \cdot \frac{1}{2}\ln x = 7 \cdot 2$

$\ln x = 14$

$e$

$e^{14} = x$

20. $-54 = 10 - (x-10)^{\frac{3}{2}}$

$-10 \quad -10$

$-64 = -(x-10)^{\frac{3}{2}}$

$(64)^{2/3} = [(x-10)^{3/2}]^{2/3}$

$(64^{1/3})^2 = x-10$

$4^2 = 16 = x-10$

$x = 26$

21. $\left(\sqrt[4]{v^5}\right) = 243$

$\left(v^{\frac{5}{4}}\right)^{\frac{4}{5}} = (243)^{\frac{4}{5}}$

$v = \left(243^{\frac{1}{5}}\right)^4$

$v = 3^4 = 81$

$\Rightarrow \log_2 2$

22. $\log_2(x-4) - \log_2 3 = 1 - \log_2(x+1)$

$\log_2(x-4) - \log_2 3 = \log_2 2 - \log_2(x+1)$

$\log_2 \frac{x-4}{3} = \log_2 \frac{2}{x+1}$

$\frac{x-4}{3} = \frac{2}{x+1} \rightarrow (x+1)(x-4) = 6$

$x^2 - 3x - 4 = 6 \rightarrow$

$x^2 - 3x - 10 = 0$

$(x+2)(x-5) = 0$

$x = -2, 5$

23. $\log_2\left(\log_3\left(\log_{\frac{2}{3}} x\right)\right) = 0$

$1 = 2^0 = \log_3\left(\log_{\frac{2}{3}} x\right) = 1$

$3^1 = \log_{\frac{2}{3}} x$

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

$\frac{8}{27} = x$

Graph each of the following on a separate sheet of graph paper. State the equation of the asymptote, domain, range and end behavior. ON SEP. GRAPH PAPER

24. $y = \frac{1}{2}(3)^{-2x+6} - 4$

25. $y = 2(2)^{x+4} - 1$

26. $y = \log_2(2x + 10) - 4$

27. $y = -\log_3(x - 2) - 3$

Find the inverse of the following: SEE AFTER GRAPHS

28. $f(x) = \log_8 x + 5$

29. $f(x) = \log_8(x - 3) - 7$

30. $f(x) = 6^{x-4} + 1$

31. $f(x) = 3^x - 2$

(24) $y = \frac{1}{2}(3)^{-2(x-3)} - 4$

$y = \frac{1}{2}\left(\frac{1}{3}\right)^{2(x-3)} - 4$

$y = \frac{1}{2}\left(\frac{1}{9}\right)^{x-3} - 4$

right 3

down 4

$\frac{1}{2}$ as tall

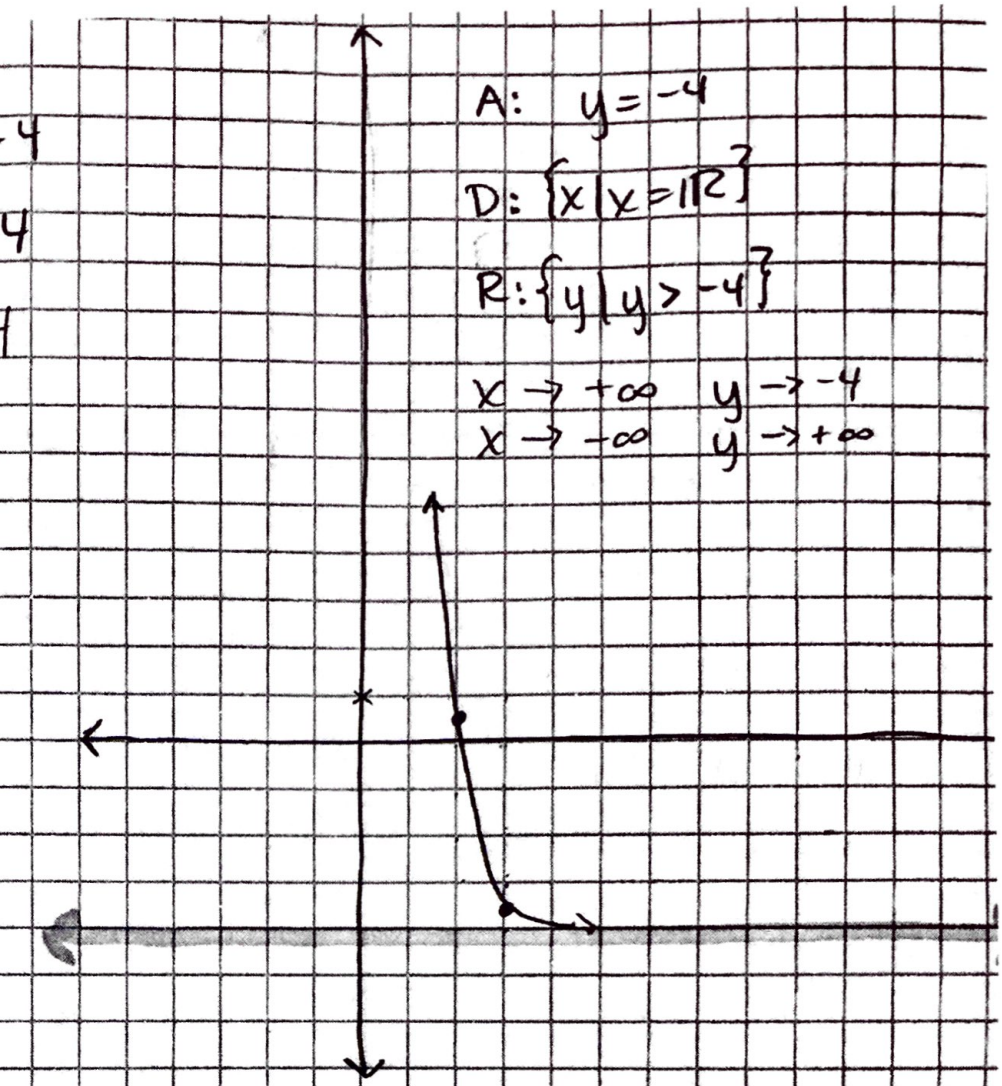
A: $y = -4$

D: $\{x \mid x = \mathbb{R}\}$

R: $\{y \mid y > -4\}$

$x \to +\infty \quad y \to -4$

$x \to -\infty \quad y \to +\infty$



(25) $y = 2\left(\frac{2}{1}\right)^{x+4} - 1$

right 4

down 1

twice as tall

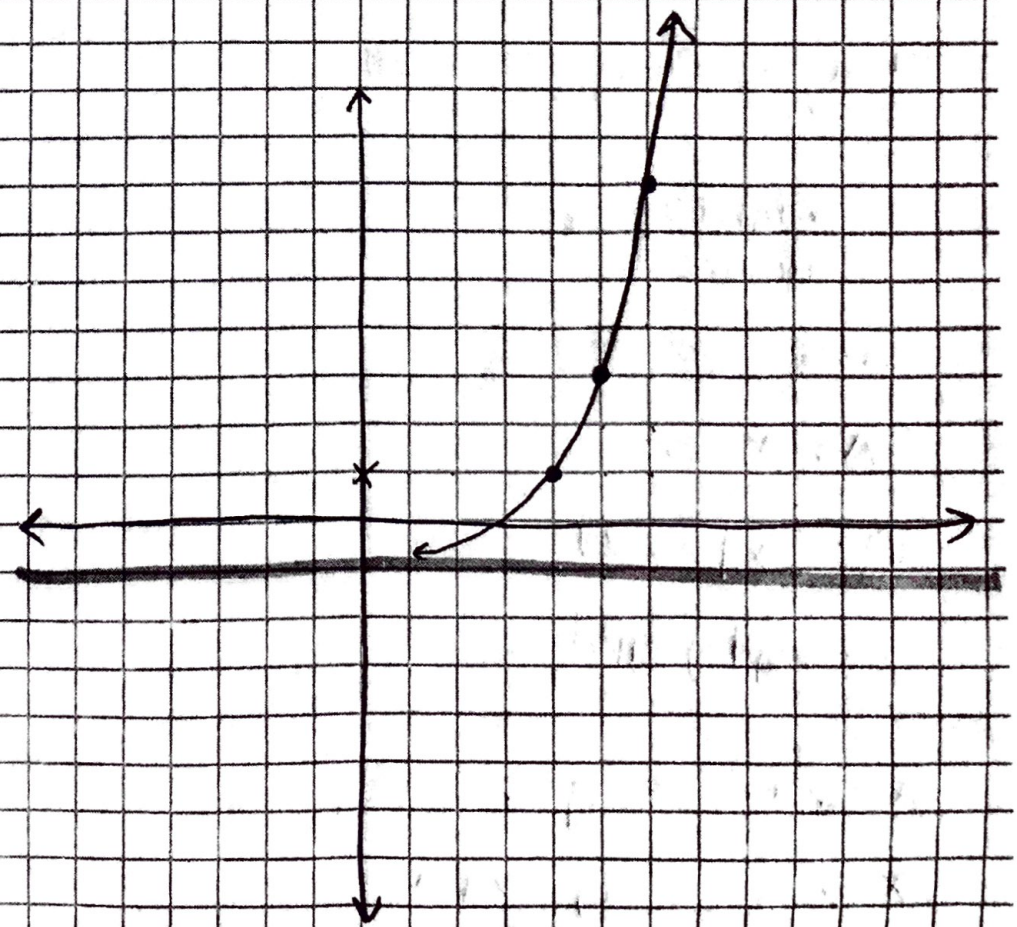
A: $y = -1$

D: $\{x \mid x = \mathbb{R}\}$

R: $\{y \mid y > -1\}$

$x \to +\infty \quad y \to +\infty$

$x \to -\infty \quad y \to -1$



(26) $y = \log_2(2x+10) - 4$

$y = \log_{\frac{1}{2}}[2(x+5)] - 4$

left 5
down 4
½ as wide

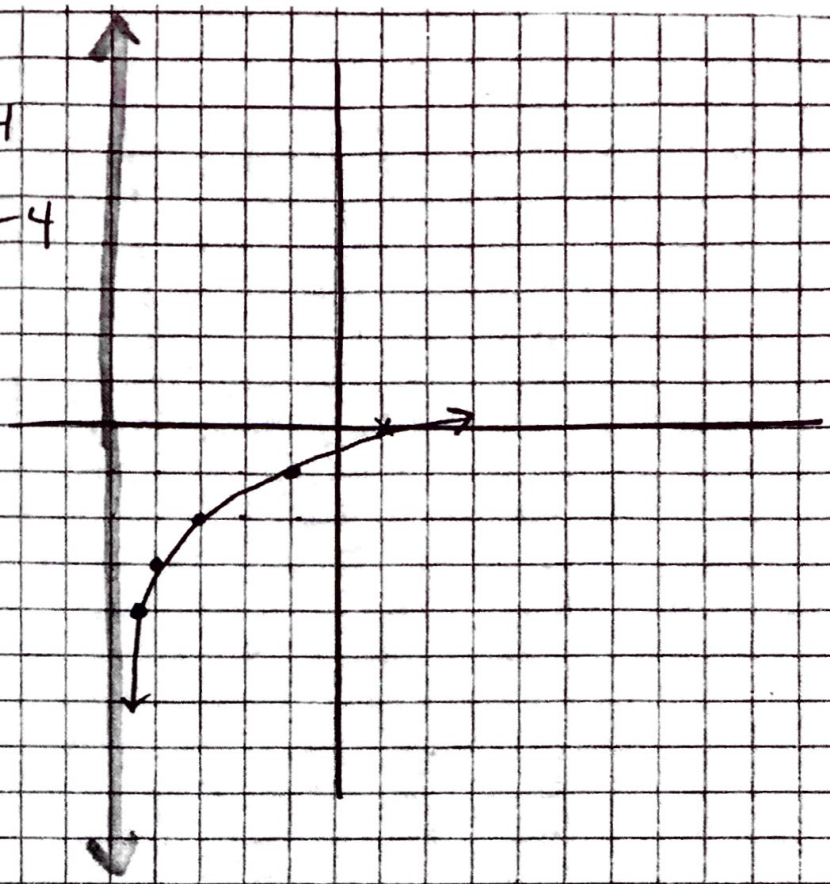
A: $x = -5$

D: $\{x \mid x > -5\}$

R: $\{y \mid y = \mathbb{R}\}$

$x \to +\infty \quad y \to +\infty$

$x \to -5 \quad y \to -\infty$



(27) $y = -\log_3(x-2) - 3$

right 2
down 3

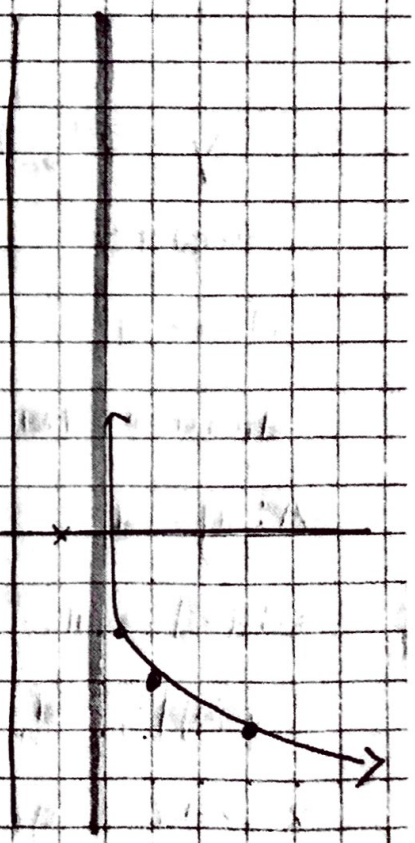
A: $x = 2$

D: $\{x \mid x > 2\}$

R: $\{y \mid y = \mathbb{R}\}$

$x \to +\infty \quad y \to -\infty$

$x \to 2 \quad y \to +\infty$



**Find the inverse of the following:**

28. $f(x) = \log_8 x + 5$

$x = \log_8 y + 5$

$x - 5 = \log_8 y$

$8^{x-5} = y$

$f^{-1}(x) = 8^{x-5}$

29. $f(x) = \log_8(x-3) - 7$

$x = \log_8(y-3) - 7$

$x + 7 = \log_8(y-3)$

$8^{x+7} = y - 3$

$8^{x+7} + 3 = y$

$f^{-1}(x) = 8^{x+7} + 3$

30. $f(x) = 6^{x-4} + 1$

$x = 6^{y-4} + 1$

$x - 1 = 6^{y-4}$

$y - 4 = \log_6(x-1)$

$y = \log_6(x-1) + 4$

$f^{-1}(x) = \log_6(x-1) + 4$

31. $f(x) = 3^x - 2$

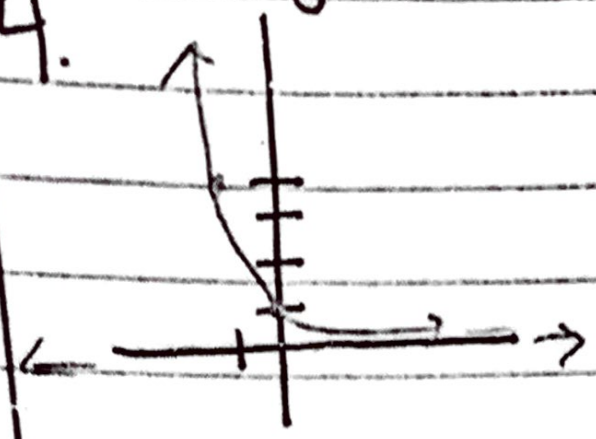
$x = 3^y - 2$

$x + 2 = 3^y$

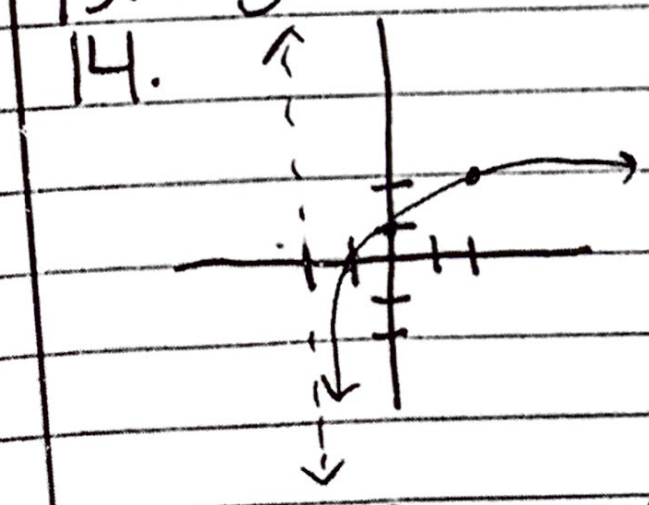
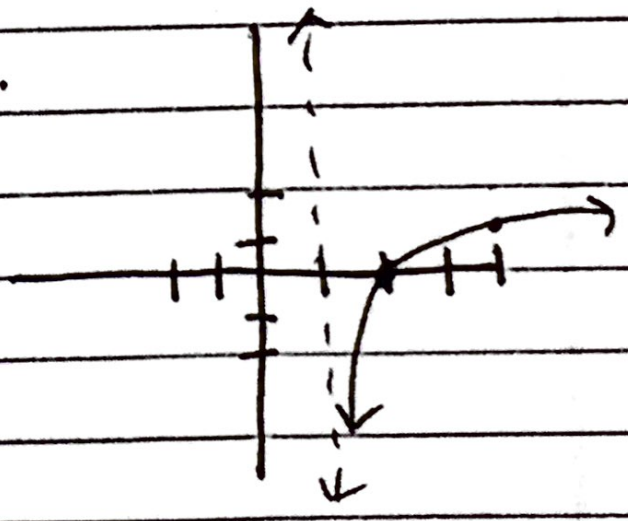
$y = \log_3(x+2)$

$f^{-1}(x) = \log_3(x+2)$

# Unit 3 Review Sheet

1. 676
2. 105
3. a. growth 82%. b. decay 58%.
4. 
5. $y = \frac{6}{5}(5)^x$

6. $832.23
7. $3995.39
8. 65.559 mg
9. $\log_{27} 81 = \frac{4}{3}$

10. $67^2 = 4489$
11. $2^x = \frac{1}{8}$, $x = -3$
12. $x = -4$
13. 3
14. 
15. 
16. $\log 2 + 2\log(x+1)$
17. $\log 8 - \log 27$
18. $x \approx 10.843$
19. $x \approx 2.287$
20. $x \approx 0.544$
21. $x = 9$

22. $X = 6.0625$
23. $X \approx 81373.89$
24. $X \approx 13.930$
25. $X = 75$
26. $X = -1$
27. $X = -.6397$
28. $K = 0.07006$
Pop. in 1980 = 2,864,082