Algebra 2 Honors
WS: Chapter 4 Review

Name key
Date 5/9, 5/10 Block 2A, 1B

Graph each function. State the domain, range and asymptote.
Note: Your graph should include *at least* three clearly labeled points and the asymptote.

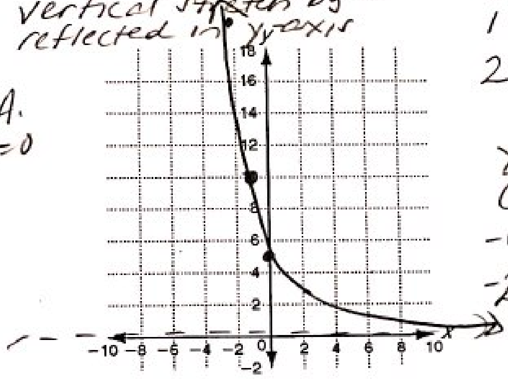
1. $g(x)=5(2^{-x})$

vertical stretch by 5
reflected in y-axis

H.A. $y=0$

x	2^x
0	1
1	2
2	4

x	$5(2^{-x})$
0	5
-1	10
-2	20



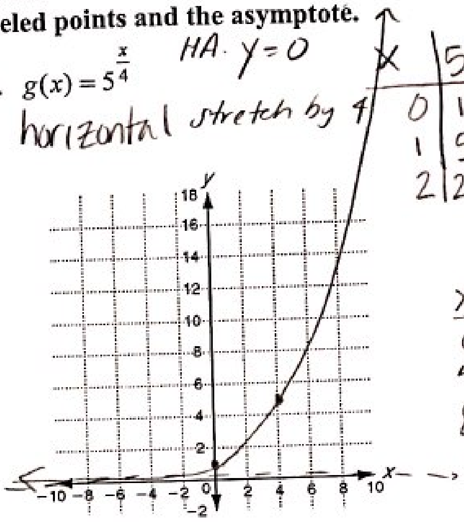
2. $g(x)=5^{\frac{x}{4}}$

HA $y=0$

horizontal stretch by 4

x	5^x
0	1
1	5
2	25

x	$5^{\frac{x}{4}}$
0	1
4	5
8	25



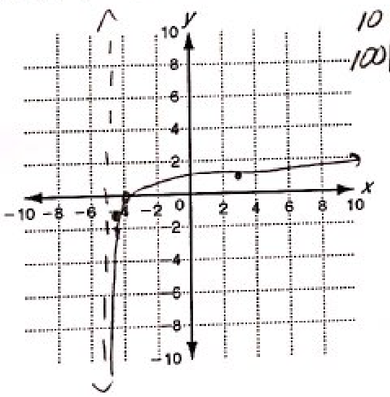
3. $g(x)=\log(x+5)$

shifted left 5

VA $x=-5$

x	$\log x$
1/10	-1
1	0
10	1
100	2

x	$g(x)$
-49/10	-1
-4	0
5	1
95	2



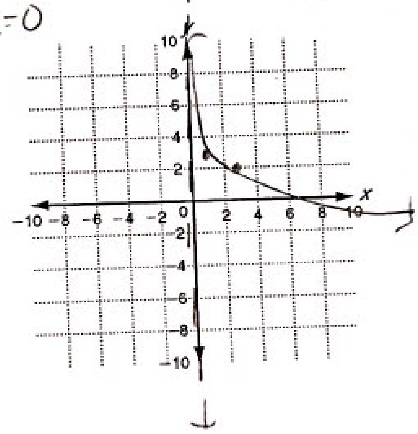
4. $g(x)=3-\ln x$

reflection in x
up 3

VA $x=0$

x	$\ln x$
1/e	-1
1	0
e	1
e^2	2

x	$g(x)$
1/e	4
1	3
e	2
e^2	1



5. **Given the set of transformations on f, $f(x)=\log_4 x$, write the equation that yields g.**

a. 3 units left, 2 units up $g(x)=$ $\log_4(x+3)+2$

b. 4 units right, reflection in the x-axis $g(x)=$ $-\log_4(x-4)$

c. reflection in the y-axis, down 3 $g(x)=$ $\log_4(-x)-3$

6. **Write the transformed function.**
The function $f(x)=8\cdot 7^{2x}-5$ is horizontally stretched by a factor of 2, vertically compressed by a factor of 0.5, translated 1 unit right, and reflected across the x-axis.

$f(\tfrac{1}{2}x) = 8\cdot 7^{x}-5$

$= 4\cdot 7^{x} - 5/2$

$4\cdot 7^{x-1} - 5/2$

$\boxed{g(x) = -4\cdot 7^{x-1} + 5/2}$

$5^{\log_5 \frac{30}{2}}$

In 7 -14, evaluate each expression WITHOUT A CALCULATOR.

7. $\log_3 81^5$

$5\log_3 81 = 5(4) = 20$

8. $\log_{\frac{1}{4}} 8 = \frac{\log_2 8}{\log_2 \frac{1}{4}} = \frac{3}{-2}$

9. $(\log 10^{8x})(\ln e^7)$

$(8x)(7) = 56x$

10. $5^{\log_5 30 - \log_5 2}$

$5^{\log_5 15} = 15$

11. $\ln e$ $= 1$

12. $2\log 5 + \log 4$

$\log 5^2 + \log 4$

$\log(100) = 2$

13. $e^{\ln 3xy^2}$

$3xy^2$

14. $\log_6 \frac{1}{216}$

-3

15. Rewrite $\log_{16} \frac{1}{4} = -\frac{1}{2}$ in exponential form.

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

16. Rewrite $3^{-4} = \frac{1}{81}$ in logarithmic form.

$\log_3 \frac{1}{81} = -4$

17. Colleen's station wagon is depreciating at a rate of 9% per year. She paid \$24,500 for it in 2002. What will the car be worth in 2008 to the nearest hundred dollars?

$V(t) = 24{,}500(0.91)^t$

$V(6) = 24{,}500(0.91)^6 =$ \$13,900

18. A parcel of land Jason bought in 2000 for \$100,000 is appreciating in value at a rate of about 4% each year. Write a function to model the appreciation of the value of the land, and determine (algebraically) in what year ~~will~~ will the land double its value?

$A = 100000(1.04)^t$

$200000 = 100000(1.04)^t$

$2 = 1.04^t$

$\log_{1.04} 2 = t$

$t = \frac{\log 2}{\log 1.04} = 17.67$

by 2018 the land will have doubled it's value

$A = Pe^{rt}$

19. A deposit of \$10,000 is made in a savings account for which the interest is compounded continuously. The balance will double in 5 years.

a. What is the annual interest rate for this account?

$20000 = 10000e^{r(5)}$

$2 = e^{5r}$ $\quad r = \frac{\ln 2}{5} = 0.1386$

$\boxed{13.86\%}$

b. Find the balance after 3 years.

$A = 10000e^{0.1386(3)} = \boxed{\$15{,}155.83}$

20. Ariana has a choice of two investments. She can invest \$12,000 at 5% for 8 years, or she can invest \$9000 at 6.5% for 7 years. Both accounts are compounded continuously. Which investment will result in the greater amount of interest earned?

↳ The first one (\$12000@5%)

$A = Pe^{rt}$

$A = 12000e^{0.05(8)}$

\$17,901.89

\$5,901.89 interest earned

$A = 9000e^{0.065(7)}$

$A =$ \$14,185.56

\$5185.56 interest earned

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Use the natural decay function, $N(t)=N_0e^{-kt}$, to find the decay constant for a substance that has a half-life of 1000 years.

$\frac{1}{2}=e^{-k(1000)}$

$k=\frac{\ln 1/2}{-1000}=\boxed{0.000693}$

22. Use the natural decay function, $N(t)=N_0e^{-kt}$, to find the age of a fossil containing 35% of the original amount of a particular substance. This substance has a half-life of 2450 years.

$\frac{1}{2}=e^{-k(2450)}$

$\ln\frac{1}{2}=-2450k$

$k=\frac{\ln 1/2}{-2450}=\boxed{0.000283}$

$0.35=e^{-0.000283t}$

$t=\frac{\ln 0.35}{-0.000283}=\boxed{3709.62 \text{ years}}$

TYPO

23. Newton's Law of Cooling $T=T_S+(T_0-T_S)e^{-kt}$, where T_0 is the initial temperature and T_S is the surrounding temperature.

Your car just overheated on the drive home from work and is stuck on the side of the road. It overheated at 300°F and can be driven again at 230°F. If $k=0.0048$ and it is 65°F outside, how long (in minutes) do you have to wait until you can continue driving?

T_0 T_s

$230=65+(300-65)e^{-0.0048t}$

$165=235e^{-0.0048t}$

$\frac{33}{47}=e^{-0.0048t}$

$\frac{\ln\frac{33}{47}}{-0.0048}=\boxed{t=73.68 \text{ minutes}}$

Use the change of base formula to evaluate:

24. $\log_5 7=\frac{\log 7}{\log 5}=1.209$

25. $\log_{\frac{1}{3}}\frac{1}{5}=\frac{\log\frac{1}{5}}{\log\frac{1}{3}}=1.465$

Use $\log_a 2\approx 0.3562$ and $\log_a 3\approx 0.5646$ to rewrite and evaluate the following expressions.

26. $\log_a\left(\frac{2}{3}\right)\approx -0.2084$

$\log_a 2-\log_a 3$

$0.3562-0.5646$

27. $\log_a 6=\log_a(2\cdot 3)$

$=\log_a 2+\log_a 3$

$=0.3562+0.5646$

0.9208

28. $\log_a\frac{9}{4}=\log_a\frac{3^2}{2^2}$

$\log_a 3^2-\log_a 2^2$

$2\log_a 3-2\log_a 2$

$2(0.5646)-2(0.3562)=0.4168$

Expand each expression.

29. $\log_5 7x^3y$

$\log_5 7+3\log_5 x+\log_5 y$

30. $\ln\left(\frac{x^2y^3}{x-y}\right)$

$2\ln x+3\ln y-\ln(x-y)$

31. $\ln\sqrt{x^3y^2}=\ln(x^3y^2)^{1/2}$

$\frac{3}{2}\ln x+\ln y$

Condense each expression.

32. $\frac{1}{3}\log_4(x+y)$

$\log_4(x+y)^{1/3}$

$\boxed{\log_4 \sqrt[3]{x+y}}$

33. $3\ln(x-2)-2\ln(x+2)$

$\ln\frac{(x-2)^3}{(x+2)^2}$

34. $\log 8+3\log x-\log 7$

$\log\frac{8x^3}{7}$

Solve each equation *algebraically*. Work MUST be shown.

35. $16^{3x}=8^{x+6}$

$(2^4)^{3x}=(2^3)^{x+6}$

$12x=3x+18$

$9x=18$

$x=2$

36. $-4\log_6(9x)-7=-23$

$-4\log_6(9x)=-16$

$\log_6(9x)=4$

$6^4=9x$

$x=\frac{6^4}{9}=144$

37. $12^{x-1}=20^2$

$\log_{12}12^{x-1}=\log_{12}400$

$x-1=\frac{\log 400}{\log 12}$

$x=\frac{\log 400}{\log 12}+1=3.411$

38. $\left(\frac{1}{16}\right)^{x+5}=8^2$

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

$-4x-20=6$

$-4x=26$

$x=-13/2$

39. $216^{\frac{x}{3}}=36^{2x+3}$

$(6^3)^{x/3}=(6^2)^{2x+3}$

$x=4x+6$

$-3x=6$

$x=-2$

40. $7\cdot 9^{2x-4}+3=45$

$7\cdot 9^{2x-4}=42$

$9^{2x-4}=6$

$\log_9 9^{2x-4}=\log_9 6$

$2x-4=\frac{\log 6}{\log 9}$

$x=\frac{\frac{\log 6}{\log 9}+4}{2}$

$x=2.408$

41. $e^{4x}-7=10$

$e^{4x}=17$

$\ln e^{4x}=\ln 17$

$4x=\ln 17$

$x=\frac{\ln 17}{4}=0.708$

42. $3+e^{-2x}=11$

$e^{-2x}=8$

$-2x=\ln 8$

$x=\frac{\ln 8}{-2}=-1.040$

43. $\log_5(4x-5)^2=6$

$\sqrt{5^6}=\sqrt{(4x-5)^2}$

$4x-5=\pm 5^3$

$4x=5\pm 5^3$

$x=\frac{5\pm 5^3}{4}$ 32.5, -30

44. $\log x-\log 8=3$

$\log\frac{x}{8}=3$

$10^3=\frac{x}{8}$

$x=8\cdot 10^3=8000$

45. $\ln(x^2-9)=\ln(5x+5)$

$x^2-9=5x+5$

$x^2-5x-14=0$

$(x-7)(x+2)=0$

$x=7$ $\cancel{-2}$

46. $\log x^3+\log 8=3$

$\log 8x^3=3$

$10^3=8x^3$

$x=\sqrt[3]{\frac{10^3}{8}}=5$

47. $\log(x^2-1)-\log 12=1$

$\log\frac{x^2-1}{12}=1$

$10^1=\frac{x^2-1}{12}$

$120=x^2-1$

$x^2=121$

$x=\pm 11$

48. $\ln 5x-9=11$

$\ln 5x=20$

$5x=e^{20}$

$x=\frac{e^{20}}{5}=97033039.08$

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