Station 3

pg. 513 # 2

Graph $f(x)=\log_2 x$ $g(x)=\log_2(x-1)$

a) Graph

b) State Asymptotes & graph

c) Domain $(1,\infty)$

d) Range $(-\infty,\infty)$

$y=\log_2 x$

$2^y=x$

x	y
$\frac{1}{4}$	-2
$\frac{1}{2}$	-1
1	0
2	1
4	2

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Station 1

Write a Sentence

pg. 513 23 & 24

23) Invest $3000. Which investment yields the greater return over 10 years 6.5% compounded semi-annually or 6% compounded continuously? How much more

$A=3000\left(1+\frac{.065}{2}\right)^{2\cdot 10}$ $A=5687.51$

$A=3000e^{.06(10)}$ $A=5466.36$

24) How long to the nearest tenth of year will it take $4000 to grow to $8000 at 5% annual interest compounded quarterly?

$\frac{8000}{4000}=\frac{4000\left(1+\frac{.05}{4}\right)^{4t}}{4000}$

$2=1.0125^{4t}$

$\ln 2=\ln 1.0125^{4t}$

$\ln 2=4t\cdot\ln 1.0125$

$\frac{\ln 1.0125}{\ln 1.0125}$ $\frac{\ln 2}{\ln 1.0125}=4t$

$55.798=4t$

$13.95=t$

It will take 13.95 years to grow from $4000 to $8000

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Station 4

Expand each log

pg. 511 50-53

50. $\log_6 36x^3$ $\log_6 36+\log_6 x^3$ $2+3\log_6 x$

51. $\log_4\left(\frac{\sqrt{x}}{64}\right)$ $\log_4 x^{\frac{1}{2}}+\log_4 64$ $\frac{1}{2}\log_4 x+3$

52. $\log_2\left(\frac{xy^2}{64}\right)$ $\log_2 x+2\log_2 y-\log_2 64$ $\log_2 x+2\log_2 y-6$

53. $\ln\sqrt[3]{\frac{x}{e}}$ $\ln x^{\frac{1}{3}}-\ln e^{\frac{1}{3}}$ $\frac{1}{3}\ln x-\frac{1}{3}\ln e$ $\ln e=1$ because $\ln e$ means $\log_e e=\square$ $e^{\square}=e$ $\frac{1}{3}\ln x-\frac{1}{3}$

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Station 2

pg. 510 19-29 Don't use calc

19. $\log_4 64=3$ $4^{\square}=64$

20. $\log_5\frac{1}{25}=-2$ $5^{\square}=\frac{1}{25}$

21. $\log_3(-9)$ Not pass $\times$

22. $\log_{16}4=\frac{1}{2}$ $16^{\square}=4$

23. $\log_{17}17=1$ $17^{\square}=17$

24. $\log_3 3^8=8$ $3^{\square}=3^8$

25. $\ln e^5=5$ $e^{\square}=e^5$

26. $\log_3\frac{1}{\sqrt{3}}=-\frac{1}{2}$ $3^{\square}=\frac{1}{\sqrt{3}}$

27. $\ln\frac{1}{e^2}=-2$ $3^{\square}=\frac{1}{e^2}$

28. $\log\frac{1}{1000}=-3$ $10^{\square}=\frac{1}{1000}$

29. $\log_3(\log_8 8)=0$ $\log_8 8=1$ $\log_3 1$ $3^{\square}=1$

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Station 7

Solve each log
check for extraneous

pg. 513 15, 17, 18

15. $\log_6(4x-1)=3$

$6^3=4x-1$

$216=4x-1$

$217=4x$

$x=\frac{217}{4}\approx 54.25$

17. $\log x+\log(x+15)=2$

$\log x(x+15)=2$

$10^2=x^2+15x$

$0=x^2+15x+100$ 100 factors as $(x+20)(x-5)$

$x=-20$ ↑ extraneous $\quad x=5$

18. $\ln(x-4)-\ln(x+1)=\ln 6$

this that

$\ln\frac{x-4}{x+1}=\ln 6$

$\frac{x-4}{x+1}\cancel{=}\frac{6}{1}$

$6x+6=x-4$

$-x-6\quad -x-6$

$5x=-10$

$x=-2$ extraneous

Station 5

Condense each log

pg. 511 54-57

54. $\log_6 7+\log_6 3$ $\log_6 21$

55. $\log 3+3\log x$ $\log 3x^3$

56. $3\ln x+4\ln y$ $\ln x^3\cdot y^4$

57. $\frac{1}{2}\ln x-\ln y$ $\ln\frac{\sqrt{x}}{y}$

Station 8

pg. 514 #27 $A=A_0e^{kt}$

In 2010 population of Asia was 4121 Mill; In 2050, it is projected to be 5231 Mill. Write the exponential growth function that describes Asia, in Millions, t years after 2010.

(2010, 4121)

(2050, 5231)

$\frac{5231}{4121}=\frac{4121e^{k(40)}}{4121}$

$A=4121e^{.005916t}$ Model

$\frac{5231}{4121}=e^{40k}$

$\ln\left(\frac{5231}{4121}\right)=\ln e^{40k}$

$\frac{\ln\frac{5231}{4121}}{40}=\frac{40k}{40}$

Station 6

this that

Solve

pg. 513 11, 13

11. $3^{x-2}=9^{x+4}$

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

$3^{x-2}=3^{2x+8}$

$x-2=2x+8$

$-x-8\quad -x-8$

$-10=1x$

$-10=x$

13. $\frac{400e^{.005x}}{400}=\frac{1600}{400}$

$e^{.005x}=4$

$\ln e^{.005x}=\ln 4$

$\frac{.005x\cdot\ln e}{.005}=\frac{\ln 4}{.005}$

$x=\frac{\ln 4}{.005}\approx 277.26$

★ Station C ★

Solve

① $\log_3(x+6) + \log_3(x+6) = 1$

$\log_3(x+6)^2 = 1$

$\sqrt{3}^1 = \sqrt{(x+6)^2}$

$\pm\sqrt{3} = x+6$

$-6 \pm \sqrt{3} = x$

only answer $x = -6+\sqrt{3}$

② $\log x^2 - \log 2 = \log x^2$

$\log \frac{x^2}{2} = \log x^2$ this that

$\frac{x^2}{2} = x^2$ Never

$\varnothing$ no sol.

★ Station A ★

pg. 514 #26

$A = 82.3e^{.004t}$ Models the pop of Germany, A, in Millions, t years after 2010.

a) What is population of Germany in 2010? 82.3 Mill

b) Is the population increasing or decreasing? Explain how you know decay k is neg

c) In which year will the population of Germany be 79.1 million?

$\frac{79.1}{82.3} = \frac{82.3e^{-.004t}}{82.3}$

$\frac{79.1}{82.3} = e^{-.004t}$

$\ln\left(\frac{79.1}{82.3}\right) = \ln e^{-.004t}$

$\ln\left(\frac{79.1}{82.3}\right) = -.004t$

$\frac{\ln\left(\frac{79.1}{82.3}\right)}{-.004} = \frac{-.004t}{-.004}$

$t = 10.2$

In the year 2019 almost 2020 the pop. of Germany will be 79.1 Million.

★ Station D ★

Throw back problem

Graph $f(x) = -2 \cdot 3^{x-4}$ ↑ move right 4

H.A. $y = 0$

nok

Parent $y = -2 \cdot 3^x$

x	y
-2	$-\frac{2}{9}$
-1	$-\frac{2}{3}$
0	-2
1	-6
2	-18

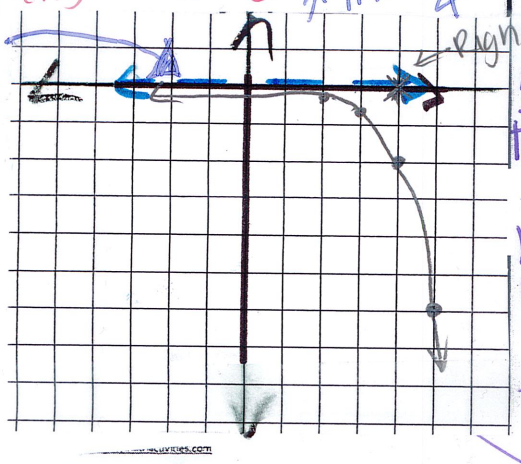
$-2 \cdot 3^{-2}$

$-2 \cdot 3^{-1}$

$-2 \cdot 3^{0}$

$-2 \cdot 3^{1}$

$-2 \cdot 3^{2}$



★ Station B ★

pg. 514 #28

use $A = A_0 e^{kt}$ $A = 100e^{-.0963t}$

half-life of Iodine-131 is 7.2 days. How long will it take for a sample of this substance to decay to 30% of its original 100%. First must find model by solving for k. Then answer the above question

Find k

$50 = 100e^{k(7.2)}$

$\frac{1}{2} = e^{7.2k}$

$\ln\left(\frac{1}{2}\right) = \ln e^{7.2k}$

$\frac{\ln\left(\frac{1}{2}\right)}{7.2} = \frac{7.2k}{7.2}$

$-.0963 = k$

$\ln\left(\frac{3}{10}\right) = -.0963t$

$t = 12.5$ day

$\frac{30}{100} = \frac{100e^{-.0963t}}{100}$

$\frac{3}{10} = e^{-.0963t}$

If you rounded $t = 9.9$

$t = 10.2$

In about 12.5 days Iodine 131 will decay from 100% to 30%

★ Station G ★

Graph $y = \log_3(x-3)+6$

right 3 up 6

parent $y = \log_3 x$

$3^y = x$

x	y
$\frac{1}{9}$	−2
$\frac{1}{3}$	−1
1	0
3	1
9	2

Domain $(3, \infty)$

Range $(-\infty, \infty)$

★ Station E ★

Solve $\frac{10e^{x-3}}{10} = \frac{50}{10}$

$e^{x-3} = 5$

this equals because $\ln e^{\square} = \square$, $e^{\square} = e$

$\ln e^{x-3} = \ln 5$

$(x-3)\ln e = \ln 5$

$x - 3 = \ln 5$

Exact $x = 3 + \ln 5$

Approx $x \approx 4.61$

★ Station H ★

pg. 514 #25

What interest rate, to the nearest tenth of a percent, is required for an investment subject to continuous compounding to double in 10 years? $A = Pe^{rt}$

$\frac{200}{100} = \frac{100e^{rt}}{100}$

$2 = e^{r(10)}$

$\ln 2 = \ln e^{10r}$ → $\frac{\ln 2}{10} = \frac{10r}{10}$

$r = .069$

In order for your investment to double the interest rate would need to be 6.90%.

★ Station F ★

Solve

① $\frac{27e^{x+7}}{27} = \frac{81}{27}$

$e^{x+7} = 3$

$\ln e^{x+7} = \ln 3$

$x + 7 \ln e = \ln 3$

$x + 7 = \ln 3$

$-7 \quad -7$ exact

$X = \ln 3 - 7$

$X \approx -5.9$

② $\frac{9}{-9} + \log_5(x+8) = 11 \; {}_{-9}$

$\log_5 x + 8 = 2$

$5^2 = x + 8$

$25 = x + 8$

$-8 \quad -8$

$= x$

$X = 17$