Problem Set # 5

Tuesday, April 5, 2016 10:56 PM

1 a $\log_2 64 = \log_2 2^6 = 6$

b $\log_2\left(\frac{1}{32}\right) = \log_2\left(\frac{1}{2}\right)^5 = -5$

c $\log_2 \sqrt{8} = \log_2 2^{3/2} = \frac{3}{2}$

d $\log_2 \frac{\sqrt{32}}{\sqrt[3]{2}} = \log_2 2^{5/2} - \log_2 2^{1/3}$

$= \frac{5}{2} - \frac{1}{3} = \frac{15}{6} - \frac{2}{6} = \frac{13}{6}$

e $\ln(e^2) = 2$

f $\ln \sqrt[3]{e^4} = \ln\left(e^{\frac{4}{3}}\right) = \frac{4}{3}$

g $2\log 10 + 3\ln e^3 = 2 + 9 = 11$

2 a $\log 10^{2x} = 2x$

b $10^{\log 2x} = 2x$

c $\log 10^{x^2+2x+1} = x^2+2x+1$

d $e^{3\ln 5x} = e^{\ln(5x)^3} = (5x)^3 = 125x^3$

3 a $120 = 3(10)^x$

$40 = 10^x$

$\log 4 + 1 = \log 40 = x$

b $120 = 3(10)^{x+3}$

$40 = 10^{x+3}$

$\log 40 = x + 3$

$-3 + \log 40 = x$

$\log 4 - 2 = x$

c $100 = \log(10x)$

$100 = \log 10 + \log x$

$99 = \log x$

$10^{99} = x$

d $100 = \log(25x^2)$

$100 = \log(5x)^2$

$100 = 2\log 5x$

$50 = \log 5x$

$$10^{50} = 5x$$

$$\frac{10^{50}}{5} = x$$

e $100 = 3e^{x+5}$

$$\frac{100}{3} = e^{x+5}$$

$$\ln\left(\frac{100}{3}\right) = x+5$$

$$\ln\left(\frac{100}{3}\right) - 5 = x$$

f $100 = \ln(25x^3)$

$$e^{100} = 25x^3$$

$$\frac{e^{100}}{25} = x^3$$

$$\sqrt[3]{\frac{e^{100}}{25}} = x$$

4 $A(t) = 1000(1.03)^t$

a 1000 is the $A(0)$

1.03 is a 3% growth per unit time

b $1000

$$2 = 1.03^t$$

c $\log 2 = t \log 1.03$

c

$$\log 2 = t \log 1.03$$

$$\frac{\log 2}{\log 1.03} = t$$

d

$$3 = 1.03^t$$

$$\log 3 = t \log 1.03$$

$$\frac{\log 3}{\log 1.03} = t$$

e

$$5 = 1.03^t$$

$$\frac{\log 5}{\log 1.03} = t$$

f

$$n = 1.03^t$$

$$\frac{\log n}{\log 1.03} = t$$

5 Let $f(x) = \log_2(x-5)$ $g(x) = \log(x+2) + 5$

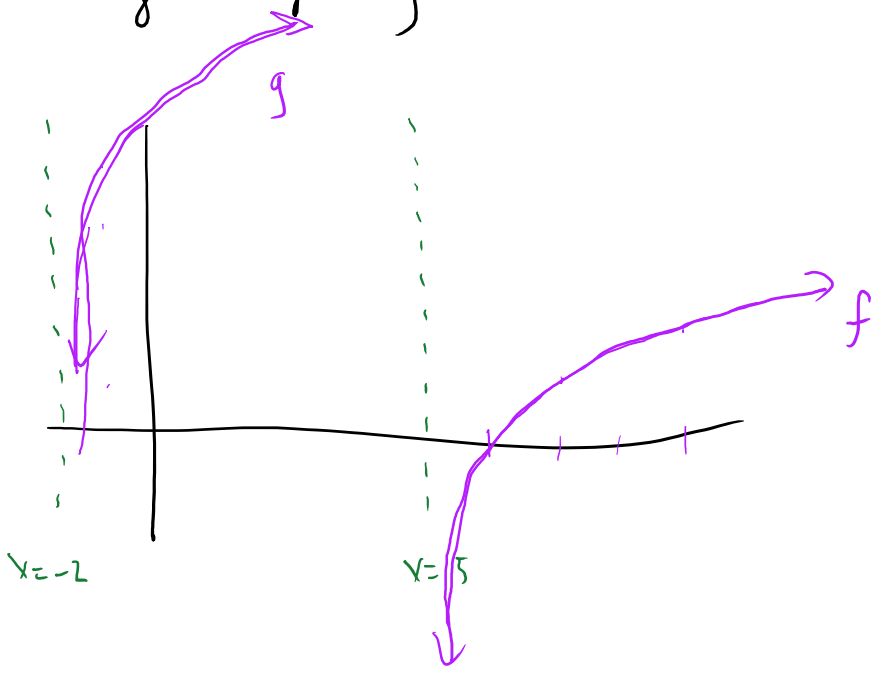
a domain of $f = \{x \mid x > 5\}$

b domain of $g = \{x \mid x > -2\}$

c range of $f = \{\mathbb{R}\}$

d range of $g = \{\mathbb{R}\}$

e



6 The scale on which the earth moves is so wide that a logarithmic scale is introduced to keep the measurements in a smaller range.

7 pH, Brightness, Sound levels.