Exercise 14C

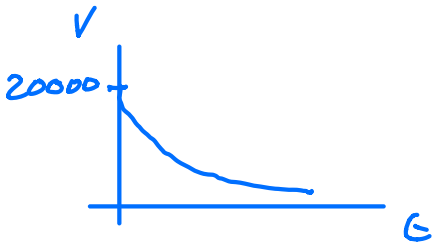
Q1 $V = 20000e^{-t/12}$

a) New value = £20000

b) After 4 years $V = 20000 \times e^{-4/12}$

$= £14331$

c)



Q3) $N = 300 - 100e^{-0.5t}$

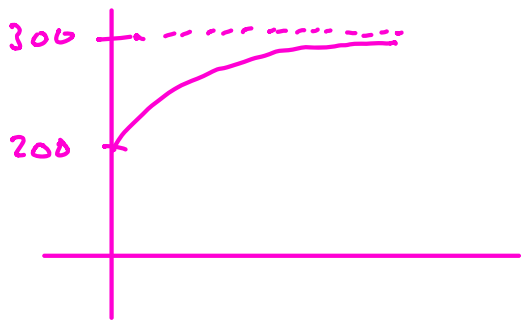
a) $t = 0$ $N = 300 - 100e^{0}$

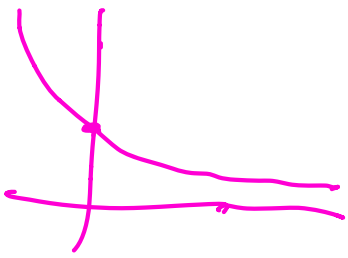
$N = 200$

b) At $t \to \infty$ $N \to 300 - 0$

$N \to 300$

c)





asymptote

Q5

$$P = e^{-0.13h}$$

a) $$P = e^{-0.13 \times 4.394}$$

$$P = 0.565 \text{ bars}$$

b) $$\frac{dP}{dh} = -0.13e^{-0.13h}$$

$$= kP \quad \text{where } k = -0.13$$

c) Negative sign indicates $\frac{dP}{dh}$ is negative

$\therefore$ Pressure is decreasing as height increases

d) At height h $\quad P = e^{-0.13h}$

At height $h+1$ $\quad P = e^{-0.13(h+1)}$

$$\frac{\text{Pressure at } h+1}{\text{Pressure at } h} = \frac{e^{-0.13(h+1)}}{e^{-0.13h}}$$

$$= \frac{e^{-0.13h-0.13}}{e^{-0.13h}}$$

$$= \frac{e^{-0.13h} \times e^{-0.13}}{e^{-0.13h}}$$

$= e^{-0.13} = 0.878$

Changed by 12.2 %

$s = 12.2$

Logarithms

$\log_a n = x$ is equivalent to $a^x = n$

Exercise 14D

1 a) $4^4 = 256$

$\log_4 256 = 4$

b) $3^{-2} = \frac{1}{9}$

$\log_3 \frac{1}{9} = -2$

e) $(0.2)^3 = 0.008$

$\log_{0.2} 0.008 = 3$

2) a) $\log_2 16 = 4 \iff 16 = 2^4$

e) $\log_{10} 100000 = 5 \iff 10^5 = 100000$

3) a) $\log_2 8 = 3$

e) $\log_3 729 = 6$

i) $\log_a(a^{10}) = 10$

4) a) $\log_5 x = 4 = 5^4 = 625$

d) $\log_2(x-1) = 3 = x - 1 = 2^3$

$x - 1 = 8$

$\underline{x = 9}$

5) a) $\log_4 230 = 2.475$

6) Why is $5 < \log_2 50 < 6$

$32 = 2^5$

$64 = 2^6$

Any number between 32 and 64 will be $2^{5.\text{something}}$

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7) $\log_2 2 = 1$ $\log_3 1 = 0$

$\log_{17} 1 = 0$

Important Results

$\log_a a = 1$ $\log_a 1 = 0$

Homework Exercises 14C even

14D