## Ex 1.7

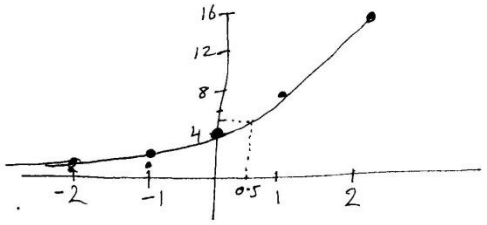
**Q1** (i) $A = f(x) = a^x$ $a > 1$, $B = f(x) = a^x$ $1 < a < 0$

(ii) $P(0,1)$

(iii) Asymptote is $y = 0$ for Both A and B.

**Q2**

| $x$ | $-2$ | $-1$ | $0$ | $1$ | $2$ |
|---|---|---|---|---|---|
| $2^x$ | $1/4$ | $1/2$ | $1$ | $2$ | $4$ |
| $4.2^x$ | $1$ | $2$ | $4$ | $8$ | $16$ |




$f(0.5) = 5.5$

**Q3**

A $\Rightarrow$ $f(x) = 3.3^x$
B $\Rightarrow$ $f(x) = 3^x$
C $\Rightarrow$ $f(x) = 2^x$

**Q4** (i) $(0,5)$ $f(0) = k.2^0 = 5$ $\quad f(0) = k.3^0 = 5$
$k = 5$ $\quad k = 5$.

(ii) $(2, 20)$ $f(2) = 5.2^2 = 20$
$2^2 = 4$ True.

$f(2) = 5.3^2 = 20$
$3^2 = 4$ false

Hence The function is $f(x) = 5.2^x$

Q5 $y = a(2^x)$

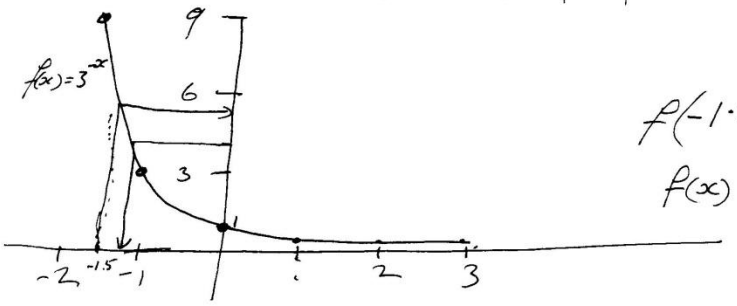
$(1, 3)$ $\quad 3 = a\,2^1$

$3 = 2a$

$3/2 = a$.

Q6

| $x$ | $-2$ | $-1$ | $0$ | $1$ | $2$ | $3$ |
|---|---|---|---|---|---|---|
| $3^{-x}$ | $9$ | $3$ | $1$ | $1/3$ | $1/9$ | $1/27$ |

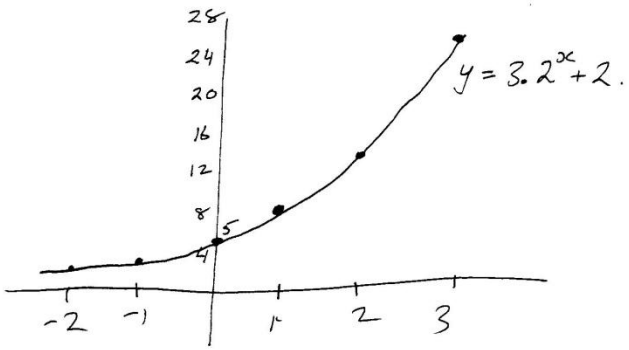



$f(-1{\cdot}5) \simeq 5$

$f(x) = 4, \quad x = -1{\cdot}25$

Q7

| $x$ | $-2$ | $-1$ | $0$ | $1$ | $2$ | $3$ |
|---|---|---|---|---|---|---|
| $y = 3.2^x + 2$ | $11/4$ | $7/2$ | $5$ | $8$ | $14$ | $26$ |




Range $= [11/4, 26]$

Q8 $y = ae^x + b$.

$(0,0)$ $0 = ae^0 + b$
$0 = a + b$.

$(1, 14)$ $14 = ae^1 + b$

Sim Eqns

$-a + b = 0$
$ae^1 + b = 14$
$ae^1 - a = 14$

$a(e-1) = 14$
$a = \frac{14}{e-1}$

$a + b = 0$
$\frac{14}{e-1} + b = 0$
$b = -\left(\frac{14}{e-1}\right)$

Q9 $y = 3 \times 4^x$

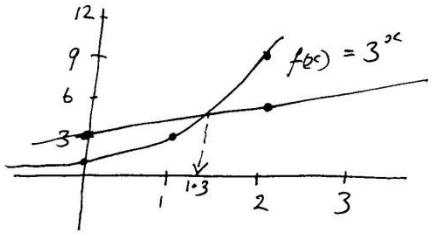
(i) $(a, 6)$ $6 = 3 \times 4^a$
$2 = 4^a$
$2^1 = 2^{2a}$
$1 = 2a$
$\frac{1}{2} = a$

(ii) $\left(-\frac{1}{2}, b\right)$ $b = 3 \times 4^{-1/2}$
$b = 3 \times \frac{1}{4^{\frac{1}{2}}}$
$b = 3 \times \frac{1}{\sqrt{4}}$
$b = 3 \times \frac{1}{2}$
$b = 3/2$

Q 10

| $x$ | 0 | 1 | 2 |
|---|---|---|---|
| $3^x$ | 1 | 3 | 9 |

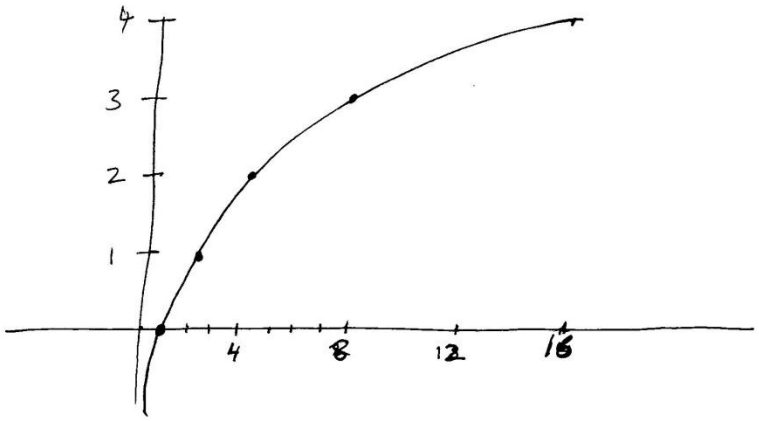
$y = x + 3$
$(0,3)$ $(2,5)$




$3^x = x + 3$
at $x = 1{\cdot}3$.

Q 11 $f(x) = \log_2 x$

| $x$ | 1 | 2 | 4 | 8 | 16 |
|---|---|---|---|---|---|
| $\log_2 x$ | 0 | 1 | 2 | 3 | 4 |



Q12 $y = a \log_2 x + b$

$(8, 10)$ $10 = a \log_2 8 + b$
$10 = a(3) + b$
$10 = 3a + b$

$(32, 14)$ $14 = a \log_2 32 + b$
$14 = a(5) + b$
$14 = 5a + b.$

$-3a + b = -10$
$5a + b = 14$
$2a = 4$
$a = 2.$

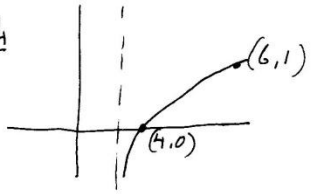
$3a + b = 10$
$3(2) + b = 10$
$b = 4$

Q13 $y = \log_a x$

$(3, 1)$ $1 = \log_a 3$

$a^1 = 3 \Rightarrow a = 3$

Q14




(a) $f(x) = \log_6 (x-3)$

$(4,0)$ $0 = \log_6 1$
$6^0 = 1$ True.

$(6,1)$ $1 = \log_6 3$
$6^1 = 3$ False.
$\Rightarrow$ Not (a).

(b) $y = \log_3 (x+3)$
$(4,0)$ $0 = \log_3 7$
$3^0 = 7$ False
$\Rightarrow$ Not (b)

(c) $y = \log_3 (x-3)$
$(4,0)$ $0 = \log_3 1$
$3^0 = 1$ True
$(6,1)$ $1 = \log_3 3$
$3^1 = 3$ True $\Rightarrow$ Ans is (c)

Q15 $y = \log_5(x-2)$

Try (A) $(-1,0)$ $\quad 0 = \log_5(-3)$
$5^0 = -3$ false

Try (B) $(3,0)$ $\quad 0 = \log_5 1$
$5^0 = 1$ True.

$(7,1)$ $\quad 1 = \log_5 5$ $\quad \Rightarrow$ Ans is (B)
$5^1 = 5$ True

Q16 $y = \log_3(x-4)$

$(9,2)$ $\quad 2 = \log_3(9-4)$
$3^2 = 9-4$
$9 = 9-4$
$13 = 9$

Q17 $T = T_0 e^{\frac{t}{20}}$

(i) $165 = T_0 e^{\frac{10}{20}}$
$165 = T_0 e^{1/2}$
$\frac{165}{e^{1/2}} = T_0$
$100^\circ = T_0$

(ii) $T = 100 e^{\frac{24}{20}}$
$T = 332^\circ$

Q18 $A_t = A_0 e^{-0.002t}$

(i) $600 = A_0 e^{-0.002(1000)}$

$600 = A_0 e^{-2}$

$\frac{600}{e^{-2}} = A_0$

$4433 = A_0$

(ii) $\frac{1}{2}$ of $4433 = 2216.5$

$2216.5 = 4433 e^{-0.002t}$

$\frac{2216.5}{4433} = e^{-0.002t}$

$0.5 = e^{-0.002t}$

$\ln 0.5 = -0.002t \ln(e)$ $\quad \ln(e) = 1$

$\ln 0.5 = -0.002t$

$\frac{\ln 0.5}{-0.002} = t$

$346.57359 = t$

$\Rightarrow 347 \text{ years} = t$

Q19 $N = 200 - Ae^{-t/20}$

(i) $91 = 200 - Ae^{-\frac{10}{20}}$

$\pm 109 = \pm Ae^{-1/2}$

$\frac{109}{e^{-1/2}} = A$

$179.71 = A$

$180 = A$

(ii) $N = 200 - 180e^{-0/20}$

$N = 200 - 180e^{0}$

$N = 200 - 180(1)$

$N = 20.$

~~(iii)~~

(iii) $N = 200 - 180e^{-t/20}$

As time increases, $x$ axis is an asymptote for $e^{t/20}$

$\Rightarrow N = 200 - 180(0) = 200.$

Q19 $N = 200 - Ae^{-t/20}$

(i) $91 = 200 - Ae^{-\frac{10}{20}}$

$\pm 109 = \pm Ae^{-1/2}$

$\frac{109}{e^{-1/2}} = A$

$179.71 = A$

$180 = A$

(ii) $N = 200 - 180e^{-0/20}$

$N = 200 - 180e^{0}$

$N = 200 - 180(1)$

$N = 20.$

(iii)

Q20 $m = M_0 e^{-kt}$

$m = \frac{9}{10} M_0 \qquad t = 10$

$\frac{9}{10} M_0 = M_0 e^{-k(10)}$

$\frac{9}{10} = e^{-10k}$

$\ln \frac{9}{10} = -10k \ln e$ (1)

$\frac{\ln \frac{9}{10}}{-10} = k$

$0.010536 = k$

$0.0105 = k$

$\Rightarrow \quad M = M_0 e^{-0.0105t}$

$m = \frac{1}{2} M_0 \quad \Rightarrow 0.5 M_0 = M_0 e^{-0.0105t}$

$0.5 = e^{-0.0105t}$

$\ln 0.5 = -0.0105t \ln(e)$

$\frac{\ln 0.5}{-0.0105} = t$

$66 = t.$

$\Rightarrow$ 66 years.