Exercise 3.3

Q. 1: Write the following into sum or difference.

(i)
$$log(A \times B) = logA + logB$$

(ii)
$$log \frac{15.2}{30.5} = log 15.2 - log 30.5$$

(iii)
$$log \frac{21 \times 5}{8} = log(21 \times 5) - log8$$

= $log21 + log5 - log8$

(iv)
$$log \sqrt[3]{\frac{7}{15}} = log \left(\frac{7}{15}\right)^{\frac{1}{3}}$$

 $= \frac{1}{3}log\left(\frac{7}{15}\right)$
 $= \frac{1}{3}(log7 - log15)$

(v)
$$log \frac{(22)^{1/3}}{5^3} = log(22)^{\frac{1}{3}} - log 5^3$$

= $\frac{1}{3} log 22 - 3 log 5$

(vi)
$$log \frac{25 \times 47}{29} = log(25 \times 47) - log 29$$

= $log 25 + log 47 - log 29$

Q. 2: Express $log x - 2log x + 3log(x+1) - log(x^2-1)$ as a single logarithm.

$$logx - 2logx + 3log(x + 1) - log(x^{2} - 1)$$

$$= logx - logx^{2} + log(x + 1)^{3} - log(x^{2} - 1)$$

$$= log \frac{x}{x^{2}} + log \frac{(x+1)^{3}}{(x^{2}-1)}$$

$$= log \frac{x}{x^{2}} + log \frac{(x+1)^{3}}{(x-1)(x+1)}$$

$$= log \frac{1}{x} + log \frac{(x+1)^{2}}{(x-1)}$$

$$= log \frac{(x+1)^{2}}{x(x-1)}$$

Q. 3: Write the following in the form of a single logarithm.

(i)
$$log 21 + log 5 = log (21 \times 5)$$

(ii)
$$log 25 - 2log 3 = log 25 - log 3^2 = log \frac{25}{3^2}$$

(iii)
$$2logx - 3logy = logx^2 - logy^3$$

= $log \frac{x^2}{v^3}$

(iv)
$$log5 + log6 - log2 = log(5 \times 6) - log2$$

= $log \frac{5 \times 6}{2}$

Q. 4: Calculate the following:

(i)
$$log_3 2 \times log_2 81 = \frac{log_2}{log_3} \times \frac{log_{81}}{log_2}$$
$$= \frac{log_3^4}{log_3}$$
$$= \frac{4log_3}{log_3}$$
$$= 4$$

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(ii)
$$log_5 3 \times log_3 25$$
 = $\frac{log_3}{log_5} \times \frac{log_2 5}{log_3}$ = $\frac{log_5^2}{log_5}$ = $\frac{2log_5}{log_5}$ = 2

Q. 3: If log 2 = 0.3010, log 3 = 0.4771, log 5 = 0.6990, then find the values of the following

(i)
$$log 32 = log 2^5$$

 $= 5log 2$
 $= 5(0.3010)$
 $= 1.5050$
(ii) $log 24 = log (8 \times 3)$
 $= log 8 + log 3$
 $= log 2^3 + log 3$
 $= 3log 2 + log 3$

=3(0.3010)+0.4771

(iii)
$$log\sqrt{3\frac{1}{3}}$$
 = $log\sqrt{\frac{10}{3}}$
= $log\left(\frac{10}{3}\right)^{\frac{1}{2}}$
= $\frac{1}{2}log\left(\frac{5\times2}{3}\right)$
= $\frac{1}{2}(log5 + log2 - log3)$
= $\frac{1}{2}(0.6990 + 0.3010 - 0.4771)$

$$= \frac{1}{2}(0.5229)$$
$$= 0.2615$$

(iv)
$$log \frac{8}{3} = log 8 - log 3$$
$$= log 2^3 - log 3$$
$$= 3log 2 - log 3$$

$$=3(0.3010)-0.4771$$

(v)
$$log30 = log(2 \times 3 \times 5)$$

= $log2 + log3 + log5$
= $0.3010 + 0.4771 + 0.6990$
= 1.4771