

Chapter 12 Exercise 12A

Q. 1.

(i) $\log_e 4 + \log_e 3 = \log_e 12$

(ii) $\log_e 6 - \log_e 7 = \log_e \frac{6}{7}$

(iii) $2 \log_e 3 + 3 \log_e 2 = \log_e 3^2 + \log_e 2^3$
 $= \log_e 9 + \log_e 8$
 $= \log_e 72$

(iv) $5 \log_e 2 - 2 \log_e 5 = \log_e 2^5 - \log_e 5^2$
 $= \log_e 32 - \log_e 25$
 $= \log_e \frac{32}{25}$

(v) $\frac{1}{2} \log_e 4 + \frac{1}{3} \log_e 27$
 $= \log_e 4^{\frac{1}{2}} + \log_e 27^{\frac{1}{3}}$
 $= \log_e 2 + \log_e 3$
 $= \log_e 6$

(vi) $\frac{1}{2} \log_e 64 - \frac{1}{3} \log_e 64$
 $= \log_e 8 - \log_e 4$
 $= \log_e 2$

(vii) $2 \log_e 10 + \log_e 6 - 3 \log_e 4$
 $= \log_e 100 + \log_e 6 - \log_e 64$
 $= \log_e \left(\frac{100 \times 6}{64} \right)$
 $= \log_e \left(\frac{75}{8} \right)$

(viii) $\log_e x^2 + \log_e x = \log_e x^3$

(ix) $\frac{1}{2} \log_e x - \log_e 7 + \log_e 2$
 $= \log_e \sqrt{x} - \log_e 7 + \log_e 2$
 $= \log_e \frac{2\sqrt{x}}{7}$

Q. 2.

(i) $e^x = e$
 $\Rightarrow x = 1$

(ii) $x = e^2$

(iii) $e^x = \frac{1}{e}$
 $\Rightarrow x = -1$

(iv) $e^x = \sqrt[3]{e}$
 $\Rightarrow x = \frac{1}{3}$

(v) $e^{\log_e x} = 8$
 $\Rightarrow x = 8$ (since e and \log_e are inverse functions).

(vi) $\log_e(e^4) = x$
 $\Rightarrow e^x = e^4$
 $\Rightarrow x = 4$

(vii) $e^{\log_e 2} = x$
 $\Rightarrow 2 = x$

(viii) $e^{2 \log_e x} = 7$
 $\Rightarrow e^{\log_e x^2} = 7$
 $\Rightarrow \sqrt{x} = 7$
 $\Rightarrow x = 49$

(ix) $e^{2 \log_e x} = 9$
 $\Rightarrow e^{\log_e x^2} = 9$
 $\Rightarrow x^2 = 9$
 $\Rightarrow x = +3$

(-3 is not possible since $\log_e(-3)$ doesn't exist).

(x) $e^{3 \log_e 4} = x$
 $\Rightarrow e^{\log_e 64} = x$
 $\Rightarrow x = 64$

(xi) $\log_e x = 1 + \log_e 2$
 $\Rightarrow \log_e x - \log_e 2 = 1$
 $\Rightarrow \log_e \frac{x}{2} = 1$
 $\Rightarrow \frac{x}{2} = e^1$
 $\Rightarrow x = 2e$

(xii) $\log_e x = 3 - \log_e 5$
 $\Rightarrow \log_e x + \log_e 5 = 3$
 $\Rightarrow \log_e 5x = 3$
 $\Rightarrow 5x = e^3$
 $\Rightarrow x = \frac{1}{5}e^3$

(xiii) $2 \log_e x = 1 - \log_e 3$
 $\Rightarrow \log_e x^2 = 1 - \log_e 3$
 $\Rightarrow \log_e x^2 + \log_e 3 = 1$
 $\Rightarrow \log_e 3x^2 = 1$
 $\Rightarrow 3x^2 = e$
 $\Rightarrow x = \sqrt{\frac{e}{3}}$