EXERCISE 2(B)

Question 1. Compute:

(i) $1^8 \times 3^0 \times 5^3 \times 2^2$

Solution:

$1^8 \times 3^0 \times 5^3 \times 2^2$

$= 1 \times 1 \times 5 \times 5 \times 5 \times 2 \times 2$

$= 125 \times 4$ (Simplifying the given equation)

$= 500$

(ii) $(4^7)^2 \times (4^{-3})^4$

Solution:

$(4^7)^2 \times (4^{-3})^4$

$= 4^{14} \times 4^{-12}$

$= 4^{14-12} = 4^2$ (Simplifying the given equation)

$= 4 \times 4 = 16$

(iii) $(2^{-9} \div 2^{-11})^3$

Solution:

$= (2^{-9+11})^3$

$= (2^2)^3 = 2^6$

(Simplifying the given equation)

$= 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$

(iv)

$$\left(\frac{2}{3}\right)^{-4} \times \left(\frac{27}{8}\right)^{-2}$$

Solution:

$$\left(\frac{2}{3}\right)^{-4} \times \left(\frac{27}{8}\right)^{-2} = \left(\frac{2}{3}\right)^{-4} \times \left(\frac{3^3}{2^8}\right)^{-2}$$

$$= \frac{2^{-4}}{3^{-4}} \times \frac{3^{-6}}{2^{-6}} = \frac{2^{-4}}{2^{-6}} \times \frac{3^{-6}}{3^{-4}}$$

$$= 2^{-4+6} \times \frac{1}{3^{-4+6}} = \frac{2^2}{3^2} = \frac{4}{9}$$

(v)

$$\left(\frac{56}{28}\right)^0 \div \left(\frac{2}{5}\right)^3 \times \frac{16}{25}$$

Solution:

$\left(\frac{56}{28}\right)^0 \div \left(\frac{2}{5}\right)^3 \times \frac{16}{25}$

$= 1 \div \frac{2^3}{5^3} \times \frac{2\times2\times2\times2}{5\times5}$

$\left[\left(\frac{56}{28}\right)^0 = 1\right]$

$= 1 \times \frac{5^3}{2^3} \times \frac{2^4}{5^2} = 5^{3-2} \times 2^{4-3}$

$= 5^1 \times 2^1 = 10$

(vi) $(12)^{-2} \times 3^3$

Solution:

$= (2 \times 2 \times 3)^{-2} \times 3^3$

$= (2^2 \times 3)^{-2} \times 3^3$

$= 2^{-2\times2} \times 3^{-2} \times 3^3$

$= 2^{-4} \times 3^{-2+3} \times 3^3$

$= 2^{-4} \times 3^1$

$= \frac{3}{2^4} = \frac{3}{2\times2\times2\times2} = \frac{3}{16}$

(vii) $(-5)^4 \times (-5)^6 \div (-5)^9$

Solution:

$= (-5)^4 \times (-5)^6 \times \frac{1}{(-5)^9}$

$= (-5)^{4+6-9}$

$= (-5)^1 = -5$

(viii)

$\left(-\frac{1}{3}\right)^4 \div \left(-\frac{1}{3}\right)^8 \times \left(-\frac{1}{3}\right)^5$

Solution:

$= \left(-\frac{1}{3}\right)^4 \times \frac{1}{\left(-\frac{1}{3}\right)^8} \times \left(-\frac{1}{3}\right)^5$

$= \left(-\frac{1}{3}\right)^{4+5-8} = \left(-\frac{1}{3}\right)^{9-8}$

$= -\frac{1}{3}$

(ix) $9^0 \times 4^{-1} \div 2^{-4}$

Solution:

$9^0 \times 4^{-1} \div 2^{-4} = 1 \times \frac{1}{4^1} \times \frac{1}{2^{-4}}$

$= 1 \times \frac{1}{4} \times 2^4 = 1 \times \frac{1}{2^2} \times 2^4$

$= 2^{4-2} = 2^2 = 4$

(x) $(625)^{-\frac{3}{4}}$

Solution:

$(625)^{-\frac{3}{4}} = (5 \times 5 \times 5 \times 5)^{-\frac{3}{4}}$

$= (5^4)^{-\frac{3}{4}} = 5^{4\times-\frac{3}{4}}$

$= 5^{-3} = \frac{1}{5^3}$

$= \frac{1}{5\times5\times5}$

$= \frac{1}{125}$

(xi)

$\left(\frac{27}{64}\right)^{-\frac{2}{3}}$

Solution:

$\left(\frac{27}{64}\right)^{-\frac{2}{3}} = \left[\frac{(3^3)}{(4^3)}\right]^{-\frac{2}{3}}$

$= \frac{3^{3\times-\frac{2}{3}}}{4^{3\times-\frac{2}{3}}} = \frac{3^{-2}}{4^{-2}}$

$= \frac{4^2}{3^2} = \frac{4\times4}{3\times3} = \frac{16}{9} = 1\frac{7}{9}$

(xii)

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

Solution:

$\left(\frac{1}{32}\right)^{-\frac{2}{5}} = \left(\frac{1}{2\times2\times2\times2\times2}\right)^{\frac{2}{5}}$

$= \left(\frac{1}{2^5}\right)^{-\frac{2}{5}} = \frac{1}{2^{5\times-\frac{2}{5}}}$

$= \frac{1}{2^{-2}} = 2^2 = 4$

(xiii) $(125)^{-2/3} \div (8)^{2/3}$

Solution:

$(125)^{-\frac{2}{8}} \div (8)^{\frac{2}{3}} = (5^3)^{-\frac{2}{3}} \div (2^3)^{\frac{2}{3}}$

$= 5^{-\frac{2}{3}\times3} \div 2^{3\times\frac{2}{3}}$

$= 5^{-2} \div 2^2 = \frac{1}{5^2} \times \frac{1}{2^2}$

$= \frac{1}{25} \times \frac{1}{4} = \frac{1}{100}$

(xiv) $(243)^{2/5} \div (32)^{-2/5}$
Solution:
$= (3 \times 3 \times 3 \times 3 \times 3)^{2/5} \div (2 \times 2 \times 2 \times 2 \times 2)^{-2/5}$
$= (3^5)^{2/5} \div (2^5)^{-2/5}$
$= 3^{5\times(2/5)} \div 2^{(-2/5)\times5} = 3^2 \div 2^{-2}$
$= 3^2 \times (1/2^{-2}) = 3^2 \times 2^{+2}$
$= 3 \times 3 \times 2 \times 2 = 36$

(xv) $(-3)^4 - (\sqrt[4]{3})^0 \times (-2)^5 \div (64)^{2/3}$
Solution:
$= ((-3) \times (-3) \times (-3) \times (-3)) - 1 \times (-2) \times (-2) \times (-2) \times (-2) \times (-2) \div (2^6)^{2/3}$
Note: $(\sqrt[4]{3})^0 = 1$
$= 3^4 + 2^5 \div 2^{6 \times (2/3)}$
$= 3^4 + 2^5 \div 2^4 = 3^4 + (2^5/2^4)$
$= 3^4 + 2^{5-4} = 3^4 + 2 = 3 \times 3 \times 3 \times 3 + 2$
$= 81 + 2 = 83$

(xvi)

$$(27)^{\frac{2}{3}} \div \left(\frac{81}{16}\right)^{-\frac{1}{4}}$$

Solution:

$$(27)^{\frac{2}{3}} \div \left(\frac{81}{16}\right)^{-\frac{1}{4}} = (3^3)^{\frac{2}{3}} \div \left(\frac{3^4}{2^4}\right)^{-\frac{1}{4}}$$

$$= 3^{3\times\frac{2}{3}} \div \frac{3^{-\frac{1}{4}\times4}}{2^{-\frac{1}{4}\times4}} = 3^2 \div \frac{3^{-1}}{2^{-1}}$$

$$= 3^2 \times \frac{2^{-1}}{3^{-1}}$$

$$= 3^{2+1} \times 2^{-1} = 3^3 \times \frac{1}{2^{+1}}$$

$$= \frac{3\times3\times3}{2} = \frac{27}{2} = 13\frac{1}{2}$$

Question 2. Simplify:
(i)

$$8^{\frac{4}{3}} + 25^{\frac{3}{2}} - \left(\frac{1}{27}\right)^{-\frac{2}{3}}$$

Solution:

$= (2^3)^{\frac{4}{3}} + (5^2)^{\frac{3}{2}} - \left(\frac{1}{3^3}\right)^{-\frac{2}{3}}$

$= 2^{3\times\frac{4}{3}} + 5^{2\times\frac{3}{2}} - \frac{1}{3^{3\times\left(\frac{-2}{3}\right)}}$

$= 2^4 + 5^3 - \frac{1}{3^{-2}}$

$= 16 + 125 - 3^2$

=141-9=132

(ii) $[(64)^{-2}]^{-3} \div [\{(-8)^2\}^3]^2$
Solution:
$= (2^6)^{-2\times-3} \div (-8)^{2\times3\times2}$
$= 2^{6\times(6)} \div (-8)^{12}$
$= 2^{+36} \div (-8)^{12}$
$= 2^{+36} \div [(-2)^3]^{12} = 2^{36} \div (-2)^{36}$
$= \frac{2^{36}}{(-2)^{36}} = \frac{2^{36}}{2^{36}}$ (36 is even)
$= 2^{36-36} = 2^0 = 1$ (therefore $a^0 = 1$)

(iii) $(2^{-3} - 2^{-4})(2^{-3} + 2^{-4})$
Solution:
$= (2^{-3})^2 - (2^{-4})^2$
$\{(a - b)(a + b) = a^2 - b^2\}$
$= 2^{-6} - 2^{-8} = \frac{1}{2^6} - \frac{1}{2^8}$

$= \frac{1}{64} - \frac{1}{256}$

$= \frac{4-1}{256} = \frac{3}{256}$

Question 3. Evaluate:
(i) $(-5)^0$
Solution:
$(-5)^0 = 1(a^0 = 1)$

(ii) $8^0 + 4^0 + 2^0$
Solution:
$8^0 + 4^0 + 2^0 = 1 + 1 + 1 = 3(a^0 = 1)$

(iii) $(8 + 4 + 2)^0$
Solution:
$(8 + 4 + 2)^0 = (14)^0 = 1(a^0 = 1)$

(iv) $4x^0$

Solution:
$4x^0 = 4 \times 1 = 4$

(v) $(4x)^0$
Solution:
$(4x)^0 = 1$

(vi) $[(10^3)^0]^5$
Solution:
$[(10^3)^0]^5 = 10^{3 \times 0 \times 5} = 10^0 = 1$

(vii) $(7x^0)^2$
Solution:
$(7x^0)^2 = 7^2 \times x^{0 \times 2} = 49 \times 1 = 49$

(viii) $9^0 + 9^{-1} - 9^{-2} + 9^{½} - 9^{-½}$
Solution:

$$9^0 + 9^{-1} - 9^{-2} + \frac{1}{9^{\frac{1}{2}}} - 9^{-\frac{1}{2}}$$

$$= 1 + \frac{1}{9} - \frac{1}{9^2} + \left(3^2\right)^{\frac{1}{2}} - \left(3^2\right)^{-\frac{1}{2}}$$

$$= 1 + \frac{1}{9} - \frac{1}{81} + 3^{2\times\frac{1}{2}} - 3^{2\times\left(-\frac{1}{2}\right)}$$

$$= 1 + \frac{1}{9} - \frac{1}{81} + 3 - 3^{-1}$$

$$= 1 + \frac{1}{9} - \frac{1}{81} + \frac{3}{1} - \frac{1}{3}$$

$$= \frac{81+9-1+243-27}{81} = \frac{333-28}{81}$$

$$= \frac{305}{81} = 3\frac{62}{81}$$

Question 4. Simplify:
(i) a^5b^2/a^2b^{-3}
Solution:
$a^5b^2/a^2b^{-3} = a^{5-2} \cdot b^{2+3} = a^3b^5$

(ii) $15y^8 \div 3y^3$
Solution:
$15y^8 \div 3y^3 = 15y^8/3y^3$
$= 5y^{\{8-3\}}$
$=5y^5$

(iii) $x^{10}y^6 \div x^3y^{-2}$
Solution:

$x^{10}y^6 \div x^3y^{-2} = (x^{10}y^6)/(x^3y^{-2})$
$= x^{10-3} \cdot y^{6+2}$
$= x^7y^8$

(iv) $5z^{16} \div 15z^{-11}$
Solution:

$$5z^{16} \div 15z^{-11} = \frac{5z^{16}}{15z^{-11}}$$

$$= \frac{5}{15} z^{16+11}$$

$$= \frac{1}{3} z^{27}$$

(v) $(36x^2)^{½}$
Solution:
$(36x^2)^{½} = (36)^{½} \cdot x^{2 \times ½}$
$= (6 \times 6)^{½} \cdot x = (6^2)^{½} \cdot x = 6x$

(vi) $(125x^{-3})^{1/3}$
Solution:
$(125x^{-3})^{1/3} = (125)^{1/3}x^{-3 \times 1/3}$
$= (5 \times 5 \times 5)^{1/3}x^{-1}$
$(5^3)^{1/3} \cdot x^{-1} = 5x - 1$
$= 5/x = 5x^{-1}$

(vii) $(2x^2y^{-3})^{-2}$
Solution:

$$\left(2x^2y^{-3}\right)^{-2} = 2^{-2}x^{2\times-2} \cdot y^{-3x-2}$$

$$= \frac{1}{2^2} x^{-4} \cdot y^6$$

$$= \frac{1}{4} \times \frac{y^6}{x^4}$$

$$= \frac{y^6}{4x^4} = \frac{1}{4} \cdot y^6x^{-4}$$

(viii) $(27x^{-3}y^6)^{2/3}$
Solution:
$(27x^{-3}y^6)^{2/3} = (27)^{2/3} \cdot x^{-3 \times (2/3)} \cdot y^{6 \times (2/3)}$
$= (3 \times 3 \times 3)^{2/3} x^{-2} \cdot y^4$
$= [(3 \times 3 \times 3)^{1/3}]^2 x^{-2} \cdot y^4$
$= 3^2x^{-2}y^4$
$= 9x^{-2}y^4$
$= 9y^4/x^2 = 9x^{-2}y^4$

(ix) $(-2x^{2/3}y^{-3/2})^6$

Solution:

$= (-2)^6 x^{(2/3) \times 6}\, y^{(-3/2) \times 6}$

$= 64x^4y^{-9}$

$= 64x^4/y^9$

$= 64x^4y^{-9}$

Question 5. Simplify:

$$\left(x^{a+b}\right)^{a-b} \cdot \left(x^{b+c}\right)^{b-c} \cdot \left(x^{c+a}\right)^{c-a}$$

Solution:

$$\left(x^{a+b}\right)^{a-b} \cdot \left(x^{b+c}\right)^{b-c} \cdot \left(x^{c+a}\right)^{c-a}$$

$$= x^{(a+b)(a-b)} x^{(b+c)(b-c)} x^{(c+a)(c-a)}$$

$$= x^{a^2-b^2} x^{b^2-c^2} x^{c^2-a^2}$$

$$= x^{a^2-b^2+b^2-c^2+c^2-a^2}$$

$$= x^0$$

$=1$

Question 6.
Simplify:

(i) $\sqrt[5]{x^{20}y^{-10}z^5} \div \frac{x^3}{y^3}$

Solution:

$$\sqrt[5]{x^{20}y^{-10}z^5} \div \frac{x^3}{y^3}$$

$$= \left(x^{20}y^{-10}z^5\right)^{\frac{1}{5}} \div \frac{x^3}{y^3}$$

$$x^{20\times\frac{1}{5}} \cdot y^{-10\times\frac{1}{5}} \cdot z^{5\times\frac{1}{5}} \div \frac{x^3}{y^3}$$

$$= x^4 \cdot y^{-2} \cdot z^1 \times \frac{y^3}{x^3}$$

$$= x^4 \cdot y^{-2} \cdot z^1 \times \frac{y^3}{x^3}$$

$$= x^{4-3} \cdot y^{-2+3} \cdot z^1$$

$= xyz$

(ii) $\left(\frac{256a^{16}}{81b^4}\right)^{\frac{-3}{4}}$

Solution:

$$\left[\frac{256a^{16}}{81b^4}\right]^{-\frac{3}{4}} = \left[\frac{4^4a^{16}}{3^4b^4}\right]^{\frac{-3}{4}}$$

Where $256 = 4 \times 4 \times 4 \times 4 = 4^4$

$81 = 3 \times 3 \times 3 \times 3 = 3^4$

$$= \frac{4^{4\times\frac{-3}{4}} \cdot a^{16\times\frac{-3}{4}}}{3^{4\times\frac{-3}{4}} b^{4\times\frac{-3}{4}}}$$

$$= \frac{4^{-3} \cdot a^{-12}}{3^{-3} \cdot b^{-8}}$$

$$= \frac{3^3b^3}{4^3a^{12}}$$

$$= \frac{27b^3}{64a^{12}}$$

$$= \frac{27}{64} \cdot a^{-12}b^3$$

Question 7

(i) $\left(a^{-2}\right)^{-2} \cdot (ab)^{-3}$

Solution:

$$\left(a^{-2}\right)^{-2} \cdot (ab)^{-3}$$

$$= \left(a^{-2\times-2} \cdot b^{-2}\right) \cdot \left(a^{-3} \cdot b^{-3}\right)$$

$$= a^{+4} \cdot b^{-2} \cdot a^{-3} \cdot b^{-3}$$

$$= a^{4-3} \cdot b^{-2-3}$$

$$= ab^{-5}$$

$$= \frac{a}{b^5}$$

(ii) $\left(x^{n} y^{-m}\right)^{4} \times\left(x^{3} y^{-2}\right)^{-n}$

Solution:

$\left(x^{n} y^{-m}\right)^{4} \times\left(x^{3} y^{-2}\right)^{-n}=x^{4 n} y^{-4 m} \times x^{-3 n} y^{2 n}$

$=x^{4 n-3 n} \cdot y^{-4 m+2 n}$

$=x^{n} y^{-4 m+2 n}$

(iii) $\left(\frac{125 a^{-3}}{y^{6}}\right)^{\frac{-1}{3}}$

Solution:

$\left[\frac{125 a^{-3}}{y^{6}}\right]^{\frac{-1}{3}}=\left[\frac{5^{3} a^{-3}}{y^{6}}\right]^{\frac{-1}{3}}$

Where $125=5 \times 5 \times 5=5^{3}$

$=\frac{5^{3 \times \frac{-1}{3}} \cdot a^{-3 \times \frac{-1}{3}}}{y^{6 \times \frac{-1}{3}}}$

$=\frac{5^{-1} \cdot a^{1}}{y^{-2}}$

$=\frac{a \cdot y^{2}}{5}$

(iv) $\left(\frac{32 x^{-5}}{243 y^{-5}}\right)^{\frac{-1}{5}}$

Solution:

$\left[\frac{32 x^{-5}}{243 y^{-5}}\right]^{\frac{-1}{5}}=\left[\frac{2^{5} x^{-5}}{3^{5} y^{-5}}\right]^{\frac{-1}{5}}$

Where $32=2 \times 2 \times 2 \times 2 \times 2=2^{5}$

$243=3 \times 3 \times 3 \times 3 \times 3=3^{5}$

$=\frac{2^{5 \times \frac{-1}{5}} \cdot x^{-5 \times \frac{-1}{5}}}{3^{5 \times \frac{-1}{5}} y^{-5 \times \frac{-1}{5}}}$

$=\frac{2^{-1} x^{+1}}{3^{-1} y^{+1}}$

$= \frac{3x}{2y}$

(v) $\left(a^{-2}b\right)^{\frac{1}{2}} \times \left(ab^{-3}\right)^{\frac{1}{3}}$

Solution:

$\left(a^{-2}b\right)^{\frac{1}{2}} \times \left(ab^{-3}\right)^{\frac{1}{3}}$

$= \left(a^{-2\times\frac{1}{2}} \cdot b^{\frac{1}{2}}\right) \times \left(a^{\frac{1}{3}}b^{-3\times\frac{1}{3}}\right)$

$= a^{-1}b^{\frac{1}{2}} \times a^{\frac{1}{3}}b^{-1}$

$= a^{-1+\frac{1}{3}}b^{\frac{1}{2}-1}$

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

$= \frac{1}{a^{\frac{2}{3}}b^{\frac{1}{2}}}$

(vi) $(xy)^{m-n} \cdot (yz)^{n-l} \cdot (zx)^{I-m}$

Solution:

$(xy)^{m-n} \cdot (yz)^{n-l} \cdot (xz)^{l-m}$

$= x^{m-n} \cdot y^{m-n} \cdot y^{n-l} \cdot z^{n-l}x^{l-m} \cdot z^{l-m}$

$= x^{m-n+l-m} \cdot y^{m-n+n-l} \cdot z^{n-l+l-m}$

$= x^{l-n} \cdot y^{m-l} \cdot z^{n-m}$

Question 8.

Show that:

$\left(\frac{x^a}{x^{-b}}\right)^{a-b} \cdot \left(\frac{x^b}{x^{-c}}\right)^{b-c} \cdot \left(\frac{x^c}{x^{-a}}\right)^{c-a} = 1$

Solution:

L.H.S. $= \left(\frac{x^a}{x^{-b}}\right)^{a-b} \cdot \left(\frac{x^b}{x^{-c}}\right)^{b-c} \cdot \left(\frac{x^c}{x^{-a}}\right)^{c-a}$

$= \left(x^{a+b}\right)^{a-b} \cdot \left(x^{b+c}\right)^{b-c} \cdot \left(x^{c+a}\right)^{c-a}$

$= x^{(a+b)(a-b)}x^{(b+c)(b-c)}x^{(c+a)(c-a)}$

$= x^{a^2-b^2} x^{b^2-c^2} x^{c^2-a^2}$

$= x^{a^2-b^2+b^2-c^2+c^2-a^2}$

$= x^0$

=1 = R.H.S

Question 9.

Evaluate:

$\frac{x^{5+n}\left(x^2\right)^{3n+1}}{x^{7n-2}}$

Solution:

$\frac{x^{5+n}\left(x^2\right)^{3n+1}}{x^{7n-2}}$

$= \frac{x^{5+n} \times x^{2(3n+1)}}{x^{7n-2}}$

$= \frac{x^{5+n} \times x^{6n+2}}{x^{7n-2}}$

$= x^{5+n+6n+2-7n+2}$

$= x^9$

Question 10. Evaluate:

$\frac{a^{2n+1} \times a^{(2n+1)(2n-1)}}{a^{n(4n-1)} \times \left(a^2\right)^{2n+3}}$

Solution:

$\frac{a^{2n+1} \times a^{(2n+1)(2n-1)}}{a^{n(4n-1)} \times \left(a^2\right)^{2n+3}}$

$= \frac{a^{2n+1} \times a^{(2n)^2-(1)^2}}{a^{4n^2-n} \times a^{2(2n+3)}}$

$= \frac{a^{2n+1} \times a^{4n^2-1}}{a^{4n^2-n} \times a^{4n+6}}$

$= a^{2n+1+4n^2-1-4n^2+n-4n-6}$

$= a^{-n-6}$

$= a^{-(n+6)}$

$= \frac{1}{a^{n+6}}$

Question 11.

$(m+n)^{-1}\left(m^{-1}+n^{-1}\right) = (mn)^{-1}$

Solution:

L.H.S. $= (m+n)^{-1}\left(m^{-1}+n^{-1}\right)$

$= \frac{1}{m+n}\left(\frac{1}{m}+\frac{1}{n}\right) = \frac{1}{m+n}\cdot\frac{n+m}{mn} = \frac{1}{mn}$

$= (mn)^{-1}$

=R.H.S.

Hence proved.

Question 12. Prove that:

(i) $\left(\frac{x^a}{x^b}\right)^{\frac{1}{ab}}\left(\frac{x^b}{x^c}\right)^{\frac{1}{bc}}\left(\frac{x^c}{x^a}\right)^{\frac{1}{ca}} = 1$

Solution:

$\left(\frac{x^a}{x^b}\right)^{\frac{1}{ab}}\left(\frac{x^b}{x^c}\right)^{\frac{1}{bc}}\left(\frac{x^c}{x^a}\right)^{\frac{1}{ca}} = 1$

L.H.S $= \left(\frac{x^a}{x^b}\right)^{\frac{1}{ab}}\left(\frac{x^b}{x^c}\right)^{\frac{1}{bc}}\left(\frac{x^c}{x^a}\right)^{\frac{1}{ca}}$

$= \left(x^{a-b}\right)^{\frac{1}{bb}}\left(x^{b-c}\right)^{\frac{1}{bc}}\left(x^{c-a}\right)^{\frac{1}{m}}$

$= x^{\frac{a-b}{ab}}\cdot x^{\frac{b-c}{bc}}\cdot x^{\frac{c-a}{ca}}$

$= x^{\frac{a-b}{ab}+\frac{b-c}{bc}+\frac{c-a}{ca}}$

$= x^{\frac{ac-bc+ab-ac+bc-ab}{abc}}$

$= x^0 = 1$=R.H.S

(ii) $\frac{1}{1+x^{a-b}} + \frac{1}{1+x^{b-a}} = 1$

Solution:

$\frac{1}{1+x^{a-b}} + \frac{1}{1+x^{b-a}} = 1$

L.H.S. $= \frac{1}{1+x^{a-b}} + \frac{1}{1+x^{b-a}}$

$= \frac{1}{x^{a-a}+x^{a-b}} + \frac{1}{x^{b-b}+x^{b-a}}$

$= \frac{1}{x^a x^{-a}+x^a x^{-b}} + \frac{1}{x^b x^{-b}+x^b x^{-a}}$

$= \frac{1}{x^a(x^{-a}+x^{-b})} + \frac{1}{x^b(x^{-b}+x^{-a})}$

$= \frac{1}{(x^{-a}+x^{-b})}\left[\frac{1}{x^a} + \frac{1}{x^b}\right]$

$= \frac{1}{x^{-a}+x^{-b}}\left[x^{-a} + x^{-b}\right]$

= 1 = R.H.S