Binomial Theorem Ex 18.2 Q9(iii)

$$x^{-15} \text{ in } \left(3x^2 - \frac{a}{3x^3}\right)^{10}$$

$$(-1)^r \, {}^{10}C_r \left(3x^2\right)^{10-r} \left(\frac{a}{3x^3}\right)^r$$

$$(-1)^r \, {}^{10}C_r \, \frac{3^{10-r} a^r}{3^r} \, x^{20-2r-3r}$$

$$\Rightarrow \quad x^{20-5r} = x^{-15}$$

$$20 - 5r = -15$$

$$35 = 5r$$

$$r = 7$$

$$(-1)^7 \, {}^{10}C_7 \, \frac{3^3 a^7}{3^7}$$

$$-\frac{40}{27} a^7$$

Binomial Theorem Ex 18.2 Q9(iv)

$$x^9 \text{ in expansion of } \left(x^2 - \frac{1}{3x}\right)^9$$

$$T_n = T_{r+1} = (-1)^r \, {}^nC_r x^{n-r} y^r$$

$$= (-1)^r \, {}^9C_r \left(x^2\right)^{9-r} \left(\frac{1}{3x}\right)^r$$

$$= (-1)^r \, {}^9C_r \times \frac{1}{3^r} \times x^{18-2r-r}$$

$$\Rightarrow \quad x^{18-3r} = x^9$$

$$18 - 3r = 9$$

$$3r = 9$$

$$r = 3$$

$$= (-1)^3 \, {}^9C_3 \, \frac{1}{3^3}$$

$$= -\frac{9 \times 8 \times 7}{3 \times 2 \times 9 \times 3}$$

$$= \frac{-28}{9}$$

Binomial Theorem Ex 18.2 Q9(v)

$$x^m \text{ in expansion of } \left(x+\frac{1}{x}\right)^n$$

$$T_n = {}^nC_r x^{n-r} y^r$$

$$= {}^nC_r x^{n-r} \left(\frac{1}{x}\right)^r$$

$$x^{n-2r} = x$$

$$n-2r = m$$

$$r = \frac{n-m}{2}$$

$$^nC_{\frac{n-m}{2}} = \frac{n!}{\left(\frac{n-m}{2}\right)!\left(\frac{n+m}{2}\right)!}$$

Binomial Theorem Ex 18.2 Q9(vi)

$$\left(1-2x^3+3x^5\right)\left(1+\frac{1}{x}\right)^8 = \left(1-2x^3+3x^5\right)\left(\begin{array}{l} {}^8C_0 + {}^8C_1\frac{1}{x} + {}^8C_2\left(\frac{1}{x}\right)^2 + {}^8C_3\left(\frac{1}{x}\right)^3 + {}^8C_4\left(\frac{1}{x}\right)^4 + \\ {}^8C_5\left(\frac{1}{x}\right)^5 + {}^8C_6\left(\frac{1}{x}\right)^6 + {}^8C_7\left(\frac{1}{x}\right)^7 + {}^8C_8\left(\frac{1}{x}\right)^8 \end{array}\right)$$

$$= -\left(2x^3\right)\left({}^8C_3\left(\frac{1}{x}\right)^3\right) + \left(3x^5 \times {}^8C_4\left(\frac{1}{x}\right)^4\right)$$

$$= -(56)+(210)$$

$$= -112+168$$

$$= 154$$

*********** END **********