1. Use the binomial theorem to complete this expansion.

\[(3x + 2y)^4 = 81x^4 + 216x^3 y + \ldots\]

(Total 4 marks)

2. Complete the following expansion.

\[(2 + ax)^4 = 16 + 32ax + \ldots\]

(Total 6 marks)

3. Consider the expansion of \((x^2 - 2)^5\).

(a) Write down the number of terms in this expansion.

(b) The first four terms of the expansion in descending powers of \(x\) are

\[x^{10} - 10x^8 + 40x^6 + Ax^4 + \ldots\]

Find the value of \(A\).

(Total 6 marks)

4. Find the term containing \(x^{10}\) in the expansion of \((5 + 2x^2)^7\).

(Total 6 marks)

5. Determine the constant term in the expansion of \(\left(x - \frac{2}{x^2}\right)^9\).

(Total 4 marks)

6. Consider the binomial expansion \((1 + x)^4 = 1 + \binom{4}{1}x + \binom{4}{2}x^2 + \binom{4}{3}x^3 + x^4\).

(a) By substituting \(x = 1\) into both sides, or otherwise, evaluate \(\frac{4}{1} + \frac{4}{2} + \frac{4}{3}\).

(b) Evaluate \(\frac{9}{1} + \frac{9}{2} + \frac{9}{3} + \frac{9}{4} + \frac{9}{5} + \frac{9}{6} + \frac{9}{7} + \frac{9}{8}\).

(Total 4 marks)