

Further Mathematics: **9231 Mathematics - Further November 2025 Question Paper** 11

The sum $(2\alpha+1)^n + (2\beta+1)^n + (2\gamma+1)^n + (2\delta+1)^n$ is denoted by S_n .

(b) Find the value of S_2 . [2]

[illegible]

(c) Given that $S_3 = -22$, find the value of S_4 . [2]

[illegible]

7 The curve C has equation $y = \frac{x+2}{x^2+3x+1}$.

(a) Find the equations of the asymptotes of C .

[2]

[illegible]

(b) Show that C has no stationary points.

[3]

[illegible]

(c) Sketch C , stating the coordinates of the intersections with the axes.

[3]

.....

(d) Sketch the curve with equation $y = \left| \frac{x+2}{x^2+3x+1} \right|$.

[2]

(e)

Find in exact form the set of values of x for which $\left| \frac{x+2}{x^2+3x+1} \right| > 2$.

[4]

Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.

[illegible]

Name:

- [1]

.....

.....

.....

.....

.....

- [1]

.....

.....

.....

.....

The matrix $\mathbf{M}$ is such that $\mathbf{M} = \frac{1}{4} \begin{pmatrix} \sqrt{6} + \sqrt{2} & \sqrt{2} - \sqrt{6} \\ \sqrt{6} - \sqrt{2} & \sqrt{6} + \sqrt{2} \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$.

- (b)** The matrix $\mathbf{M}$ represents a sequence of two geometrical transformations in the x - y plane.

[4]

[illegible]

[2]

$$m^2 \sin\left(\frac{1}{12}\pi\right) + 2m \cos\left(\frac{1}{12}\pi\right) - \sin\left(\frac{1}{12}\pi\right) = 0$$

[6]