

1. Use the inverse matrix method without the aid of the calculator to solve the system  $\begin{cases} x + 3y = 7 \\ 4x - y = 2 \end{cases}$  .

2. Draw all the non-isomorphic trees on six vertices. How many isomers does hexane ( $C_6H_{14}$ ) have?

3. Let  $A = (0, 0)$  and  $B = (6, 0)$ . If  $AP : PB = 2 : 1$ , show that the locus of  $P$  is a circle and find its centre and radius.

4. Use the limit comparison test to determine whether the series  $\sum_{n=1}^{\infty} \frac{3n^2 - n}{\sqrt{n^6 + n^3}}$  converges or diverges.
5. Consider the symmetric group  $(S_4, \circ)$ . Let  $A$  be the set of elements in  $S_4$  that commute with  $(12)(3)(4)$ .
- (a) There are four elements in  $A$ . Write them down.
- (b) Construct the operation table for  $(A, \circ)$ . Does  $(A, \circ)$  form a group? Be sure to justify your answer.