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### SECTION – {C}

(This section comprises of short answer type questions (SA) of 3 mark each)

9. For the function  $f(x) = x^3 - 6x^2 + 9x - 8$ , find the points of local maxima and local minima. 3
10. Let  $R = \{(m, n) ; m, n \in \mathbb{N}, n \text{ is the factor of } m \text{ (i.e. } n|m)\}$  then Check whether  $R$  is reflexive, symmetric and transitive. 3
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### SECTION – {D}

(This section comprises of Long answer type questions (LA) of 5 mark)

11. Find the absolute maximum and absolute minimum of function  $f(x) = \sin x + \cos x$  on  $[0, \pi]$ . 5
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### SECTION – {E}

(This section comprises of CASE BASED questions (CBQ) of 4 mark)

12. In a social media platform, a group of users  $P = \{\text{Joshua, Miriam, Ruth, Samuel}\}$  is analysed for their connection patterns. A relation  $R$  is defined on  $P$  where  $(x, y) \in R$  means "x follows y." The platform's algorithm records the following connections:
- Joshua follows himself (for profile updates).
  - Miriam follows herself and Joshua.
  - Ruth follows Ruth and Samuel.
  - Samuel follows Samuel and Joshua.
  - Joshua follows Miriam.



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Thus, the relation  $R$  is represented as  $R = \{(Joshua, Joshua), (Miriam, Miriam), (Miriam, Joshua), (Ruth, Ruth), (Ruth, Samuel), (Samuel, Samuel), (Samuel, Joshua), (Joshua, Miriam)\}$ .

Based on this case, answer the following question:

1. Check whether the following relation is reflexive.
2. Check whether the following relation is symmetric.
3. Check whether the following relation is transitive.