

Show all work clearly and in order, and circle your final answers. Justify your answers algebraically whenever possible; when you do use your calculator, sketch all relevant graphs and write down all relevant mathematics. You have 15 minutes to take this 15 point quiz.

Important: Only final answers written in the blank will receive points,

1. (10 points) $(2 + 2 + 1 \times 6)$ Fill in the blanks,

1. How many relations are there on the set $\{a, b, c, d\}$? _____
2. How many relations are there on the set $\{a, b, c, d\}$ that contain the pair (a, a) ? _____
3. Consider the relation $R = \{(2, 2), (2, 3), (2, 4), (3, 2), (3, 3), (3, 4)\}$ on the set $A = \{1, 2, 3, 4\}$. Is it ?
 - (a) reflexive? _____
 - (b) irreflexive? _____
 - (c) symmetric? _____
 - (d) antisymmetric? _____
 - (e) asymmetric? _____
 - (f) transitive? _____

2. (5 points) Let R be the relation $\{(a, b), \text{ such that } a \text{ divides } b\}$ on the set of integers. What is the symmetric closure of R ?

Final answer here: $R \cup R^{-1} =$ _____