COT 3100 Final Exam - Part A (Relations, Functions) - 25 pts (4/24/2025)
Sections ≡ 1 (mod 200)

Please CLEARLY PRINT YOUR NAME IN CAPITAL LETTERS

Last Name: _____ , First Name: _____

1) (10 pts) Let $R = \{(a, b) | \exists c \in Z^+ | ab = c^3\}$ be a relation defined over $Z^+ \times Z^+$. With proof determine if the relation is (a) reflexive, (b) irreflexive, (c) symmetric, (d) anti-symmetric and (e) transitive. Please clearly circle your choice and give a justification for your choice.

(a) Reflexive: Yes No

(b) Irreflexive: Yes No

(c) Symmetric: Yes No

(d) Anti-symmetric: Yes No

(d) Transitive: Yes No

2) (10 pts) Let $f(x) = ax^3 + bx^2 + cx + d$, for constants a, b, c and d. If f(-1), f(0) and f(1) form an arithmetic sequence, with proof, determine the value of b. (Put a circle around your answer.)

3) (4 pts) How many injective functions exist $f: A \to B$, where |A| = 4 and |B| = 8. **Express your answer in prime factorized form.**

4) (1 pt) Who composed Beethoven's 5th Symphony? _____