COT 3100 Final Exam - Part A (Relations, Functions) - 25 pts (5/2/2023)

Last Name: _____ , First Name: _____

1) (10 pts) Let the function f(x) be defined as follows: $f(x) = 4x^2 - 20x + 3$, with a domain of $\{x \in \mathcal{R} \mid x \leq \frac{5}{2}\}$. Determine (a) $f^{-1}(x)$ and (b) the domain of $f^{-1}(x)$.

$f^{-1}(x)$ = _____ , Domain of $f^{-1}(x)$ = _____

2) (10 pts) Define the relation R over the set Z^+ (positive integers) as follows:

$$R = \{(a, b) | a^b \geq b^a\}$$

With proof, determine if R is (a) reflexive, (b) irreflexive, (c) symmetric, (d) anti-symmetric and (e) transitive. (Note: To prove one of these properties, you must prove it for all positive integers. To disprove a property, you just need a single counter-example. In these cases, you will only get full credit if you clearly indicate your selected values of a and b.)

3) (5 pts) Let A = {a, b, c, d, e, f} and B = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11}. How many injective functions are there with a domain of A and a co-domain of B? Leave your answer in powers, factorials, etc. and describe conceptually what each term in your answer represents.