Answer all questions on your own. Write your name and preferred e-mail address clearly. If you are using more than one sheet of paper, make sure that you staple all the sheets together.

1. Apply the unification algorithm to the following set of equations:

\[
\{ f(f(f(x_1, x_2), x_3), x_4) =? f(x_4, f(x_3, f(x_2, f(x_1, x_1)))) \}
\]

\( f \) is a binary function and \( x_1, \ldots, x_4 \) are variables. Show all steps clearly.

2. Use the PT algorithm given in class to check whether the following expression is type correct.

\[
fn \ (x) => fn \ (y) => (x \ (y \ x))
\]

Explain all steps clearly.

3. Apply the PT algorithm to the following expression:

\[
let \ val \ f = (x \ z) \ in \ (fn \ (y) => x) \ end
\]

Explain all steps clearly.