Mid-term 2 Exam: CSC 281

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Student Name:

Student Number:

Exercise 1

Use the Rules of Inference to show the following is a valid argument:

$$
\begin{array}{r}
p \rightarrow q \\
\neg r \rightarrow \neg q \\
r \rightarrow (s \wedge u) \\
p \\
\ldots\ldots\ldots\ldots \\
\therefore s
\end{array}
$$

Exercise 2

Prove using induction the following formula for all $n \in \mathbb{N}^*$

$$\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \cdots + \frac{1}{n \times (n+1)} = \frac{n}{n+1}$$

Exercise 3

Find $f(1)$, $f(2)$, $f(3)$, and $f(4)$ if f is defined recursively by:

$$f(n+1) = 5f(n) + 2 \text{ with } f(0) = 1$$

Exercise 4

Give a recursive definition of the sequence $\{a_n\}$, $n = 1, 2, \ldots, n$ by writing a_{n+1} as a function of a_n.

- $a_n = 4n - 2$
- $a_n = 1 + (-1)^n$
- $a_n = n(n + 1)$
- $a_n = n^2$

Exercise 5: Let $f : \mathbb{R} \to \mathbb{R}$ be the absolute value function $f(x) = |x|$, and E be the relation on $\mathbb{R}$: $E = \{(x, y)|x, y \in \mathbb{R} \text{ and } |x| = |y|\}$. Show that E is an Equivalence Relation (reflexive, symmetric, and transitive).