Welcome to CSC324!

https://www.cs.toronto.edu/~david/csc324
Administrative matters

lectures -- WF
labs -- M
Administrative matters
assessments: see syllabus
Administrative matters

new programming languages
(start early!)
Administrative matters

academic integrity
Principles of Programming Languages
user -> creator
Big learning goals

1. Define, analyze, and modify syntactic features of a programming language.

2. Define and analyze semantic features of a programming language.

3. Write programs that operate on other programs.
And along the way...

Expand your definition of “programming”.
Alan Turing
(1912-1954)

Alonzo Church
(1903-1995)
Syntax

the form of the elements of a language
Grammar

the formal set of rules specifying the syntax of a language
Simple arithmetic language (infix)

\[ \text{<expr>} = \text{NUMBER} \]
\[ \quad | \quad '(', \text{<expr>}, \text{<op>}, \text{<expr>}, ')') \]
\[ \text{<op>} = '++', '~-', '*, '/', '//' \]
Simple arithmetic language (prefix)

\[ \text{<expr>} = \text{NUMBER} \]
\[ \mid ( ( \text{<op>} \text{<expr>} \text{<expr>} ) ) \]
\[ \text{<op>} = '+' \]
\[ \mid '-' \]
\[ \mid '*' \]
\[ \mid '/' \]
Expression

a syntactically-valid element of a language
Parse

transform a text representation of an expression into a “more structured” representation
"(3 + 4) * (5 - (10 / 2))"
Abstract syntax tree

a tree-based representation of a program
Semantics

the meaning of the elements of a language
The fundamental idea

computation as

evaluation of expressions
The lambda calculus

\[\text{\textlangle expr\textrangle} = \text{ID} \]

\[\mid ( \lambda \text{ID} . \text{\textlangle expr\textrangle} ) \]

\[\mid ( \text{\textlangle expr\textrangle} \text{\textlangle expr\textrangle} ) \]