Homework 1:

Question 1:

2.2.

Which of these are well-formed lists? That is, which ones have properly balanced parentheses?
a. (A B (C): Not well-formed, missing one parenthesis at the end.
((A) (B)): Well-formed and properly balanced parentheses
A B)(C D): Not well-formed, missing one parentheses in front of A
(A (B (C)): Not well-formed, missing one parentheses at the end.
(A (B (C))): Well-formed and properly balanced parentheses
(((A) (B)) (C)):Well-formed and properly balanced parentheses

2.4.
Parentheses notation for this cons cell structure:

((BOWS ARROWS) (FLOWERS CHOCOLATES))

2.6.
Match
() = NIL
(()) = (NIL)
((())) = ((NIL))
(() ()) = (NIL NIL)
(() (())) = (NIL (NIL))

2.13.

- FUN

Start	(((FUN)) (IN THE) (SUN))
C ..... AR	((FUN))
C ... AAR	(FUN)
CAAAR	FUN

- IN

Start	(((FUN)) (IN THE) (SUN))
C ..... DR	((IN THE) (SUN))
C ... ADR	(IN THE)
CAADR	IN

- THE

Start	(((FUN)) (IN THE) (SUN))
C ..... DR	((IN THE) (SUN))
C ... ADR	(IN THE)
C .. DADR	(THE)
CADADR	THE

- SUN

Start	(((FUN)) (IN THE) (SUN))
C ..... DR	((IN THE) (SUN))
C ... DDR	((SUN))
C ..ADDR	(SUN)
CAADDR	SUN

FUN = CAAAR

IN = CADR

2.15.

Function	**Result**
CAR	(A B)
CDDR	((E F))
CADR	(C D)
CDAR	(B)
CADAR	B
CDDAR	()
CAAR	A
CDADDR	(F)
CADADDR	F

2.16.

(FRED NIL)

Start	(FRED NIL)
C ... AR	FRED NIL
CAAR	FRED

⇨ CAAR = FRED

Question 2:

6. In what language is most of UNIX written?
    - Since UNIX used C as its base language which is effective for hardware interaction.

7. What is the disadvantage of having too many features in a language?
    - Having too many features in a language can make language itself more complicated. Making it hard to learn and adapt. Besides, maintaining it would be more difficult if some of its features get bugs.

8. How can user-defined operator overloading harm the readability of a program?
    - Sometimes, it makes it difficult to read the code and track errors for debugging.

9. What is one example of a lack of orthogonality in the design of C?
    - In C, arrays can be returned but structs cannot.

10. What language used orthogonality as a primary design criterion?
    - The language used orthogonality as a primary design criterion is ALGOL68.

11. What primitive control statement is used to build more complicated control statements in languages that lack them?
    - For loop or if statement is used to build more complicated control statements in languages that lack them.

12. What does it mean for a program to be reliable?
    - Reliability can help programs be more secure, and reduce the risk of getting bugs or errors. Optimizing the memories of the computer while running. And it can perform according to its specifications under all conditions.

13. Why is type-checking the parameters of a subprogram important?
    - This is because it makes it difficult to debug.

14. What is aliasing?
    - In programming, aliasing means when two or more variables or references point to the same memory location. Consequently, changing one will also affect the other, which can lead to unexpected behavior.

15. What is exception handling?
    - Exception handling is a way for a program to deal with unexpected errors during execution. Instead of crashing, the program can detect errors and take appropriate action.

16. Why is readability important to writability?
    - If code is easy to read, it's easier to write and maintain because programmers can understand it quickly and avoid mistakes.

20. What two programming language deficiencies were discovered as a result of the research in software development in the 1970s?
    - Type checking and control statement

21. What are the three fundamental features of an object-oriented programming language?
    - Data abstraction, inheritance, dynamic method binding

22. What language was the first to support the three fundamental features of object-oriented programming?

    - Smalltalk

23. What is an example of two language design criteria that are in direct conflict with each other?
    - Efficiency and readability. Efficiency makes the program run faster, often requiring low-level control and optimization. Readability makes the language easy to understand and write, which may involve high-level abstractions that can reduce performance.
24. What are the three general methods of implementing a programming language?
    - Compiler implementation, pure interpretation, and hybrid implementation.
25. Which produces faster program execution, a compiler or a pure interpreter?
    - A compiler results in faster program execution because it translates high-level language into machine code, a process that is more complex.
29. What are the advantages of implementing a language with a pure interpreter?
    - A pure interpreter makes debugging easier and allows code to run immediately without the need for compilation.