Homework 1 CSCI 330

Part 1: Lisp Textbook Questions

Question 2.2: Square Function
Write a Lisp function that computes the square of a given number.

Answer:
```lisp
(defun square (x)
  (* x x))
```

Question 2.4: Factorial Function
Write a Lisp function to compute the factorial of a given number using recursion.

Answer:
```lisp
(defun factorial (n)
  (if (<= n 1)
      1
      (* n (factorial ( n 1)))))
```

Question 2.6: Maximum of Two Numbers
Write a Lisp function to find the maximum of two numbers.

Answer:
```lisp
(defun maxoftwo (a b)
  (if (> a b)
      a
      b))
```

Question 2.13: Evaluating Lisp Expressions
Evaluate the following Lisp expression:
```lisp
```

```
(car (cdr '(A B C D)))
```
Answer: `B`

Explanation:
1. `(cdr '(A B C D))` → `(B C D)`
2. `(car '(B C D))` → `B`

Question 2.15: Evaluating Lisp Expressions
Evaluate the following Lisp expression:
```lisp
(car (cdr (cdr '(X Y Z W))))
```
Answer: `Z`

Explanation:
1. `(cdr '(X Y Z W))` → `(Y Z W)`
2. `(cdr '(Y Z W))` → `(Z W)`
3. `(car '(Z W))` → `Z`

Question 2.16: Extracting `x` Using `CAR` and `CDR`
(a) Extract `x` from `(a b x d)`
Answer:
```lisp
(car (cdr (cdr '(a b x d))))
```

(b) Extract `x` from `(a (b (x d)))`
Answer:
```lisp
(car (cdr (cdr (car (cdr '(a (b (x d)))))))
```

(c) Extract `x` from `(((a (b (x) d))))`
Answer:
```lisp
(car (cdr (car (cdr (car (car '(((a (b (x) d)))))))))
```

Part 2: Sebesta Chapter 1 Review Questions

Questions 616: Programming Language Concepts

Q6Q8: Programming languages have syntax (structure) and semantics (meaning).
Q9Q11: Compilers translate code before execution, while interpreters execute linebyline.
Q12Q13: Machine languages are lowlevel, while highlevel languages improve readability.
Q14Q16: Programming paradigms include imperative, functional, logicbased, and objectoriented.

Questions 2025: Language Evolution

FORTRAN: Designed for scientific computing.
COBOL: Created for business applications.
LISP: First functional programming language, used in AI.
ALGOL: Influenced languages like C, first structured programming language.

Question 29: Programming Trends
Objectoriented programming (OOP) uses encapsulation, inheritance, and polymorphism.
Functional programming (FP) focuses on immutability and higherorder functions.
Concurrent programming is used in multithreaded systems.