# Language Assignment #1: Scheme

**Issued:** Tuesday, September 9
**Due:** Tuesday, September 23

## Purpose

This assignment asks you to begin using a functional programming language named Scheme, which is a modern dialect of the venerable language Lisp. Lisp was designed by John McCarthy, at MIT, in 1958. Scheme was designed by Guy Steele and Gerald Sussman, at MIT, in 1975.

## Documentation

Scheme lecture slides are at:

```
1   ~buff/classes/354/pub/slides/slides-scheme.pdf
```

Scheme is described in Sections 10.0–10.3.4 of our textbook.

The onyx cluster has a Scheme interpreter, the documentation of which can be viewed by:

```
1   info mit-scheme-ref
2   info mit-scheme-user
```

and demonstrated by:

```
1   ~buff/classes/354/pub/sum/scheme
```

This documentation, in HTML, is also at:

```
1   http://www.gnu.org/software/mit-scheme/documentation/mit-scheme-ref
2   http://www.gnu.org/software/mit-scheme/documentation/mit-scheme-user
```

# Assignment

Write and fully demonstrate a function named `replace`, with this interface:

```
1   (replace source search-for replace-with)
```

The function returns a copy of `source`, with every instance of an object that matches `search-for` replaced by a copy of `replace-with`. Each argument can be an atom or a list. If no matches are found, the function simply returns a copy of `source`.

For example:

```
1    (replace 1 1 2)
2    ⇒ 2
3    (replace '(a (b c) d)
4             '(b c)
5             '(x y))
6    ⇒ (a (x y) d)
7    (replace '(a (b c) (d (b c)))
8             '(b c)
9             '(x y))
10   ⇒ (a (x y) (d (x y)))
```

Of course, you can write other functions and call them from `replace`.

You are required to use only the *pure* subset of Scheme:

- no side-effecting functions (e.g., `set-car!` and `set-cdr!`)

- no loops (e.g., `do`, `foreach`, and `map`)

Test your solution thoroughly. The quality of your test suite will influence your grade.

Finally, do not try to find a solution on the Internet. You'll possibly be asked to solve a similar problem on an exam, and if you have not developed a solution on your own, you will not be able to do so on the exam.