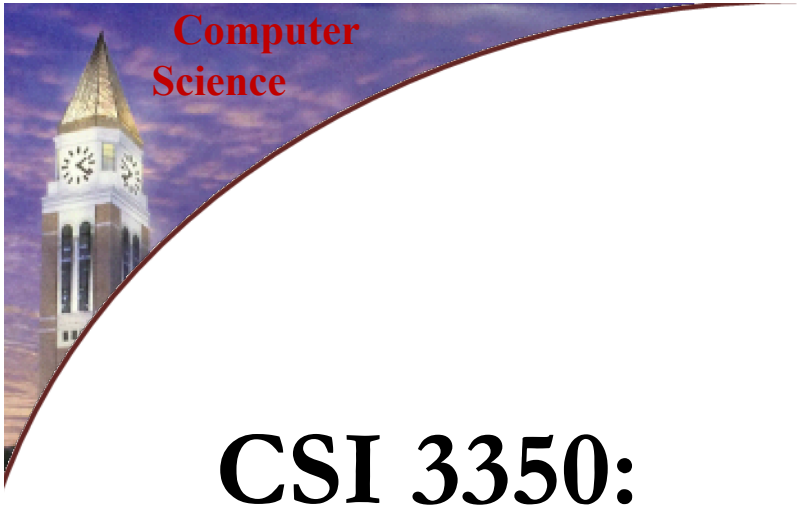

CSI 3350: PROGRAMMING LANGUAGES

Department of Computer Science & Engineering

Oakland University

Road Ahead -

HW05

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HW06

↓

Exam02

↓

HW07

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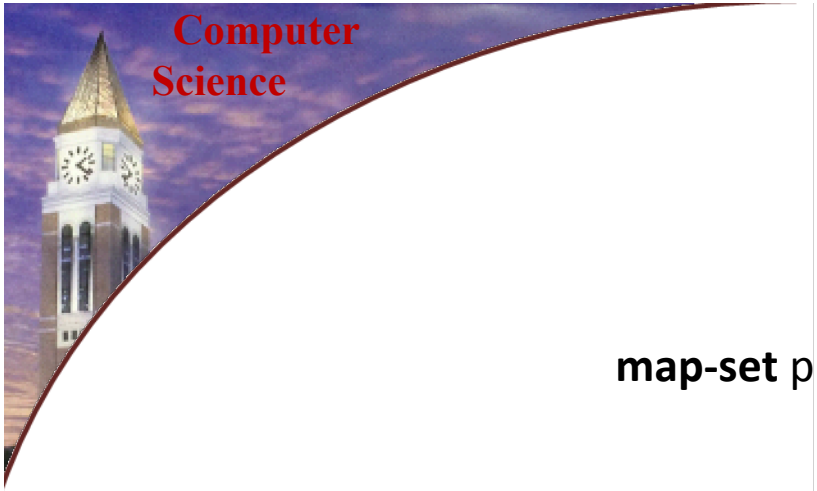
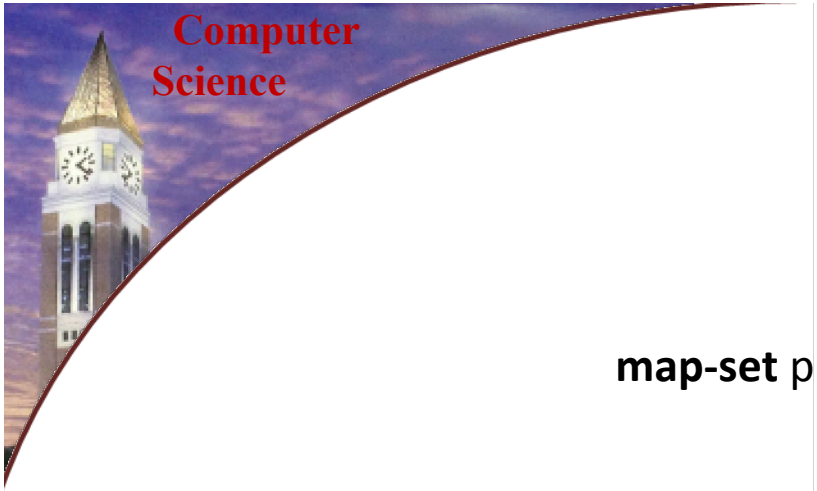
Final Exam : 7pm ~10pm : Dec 09, 2019



HW 4

(Problem 4)

map-set problem



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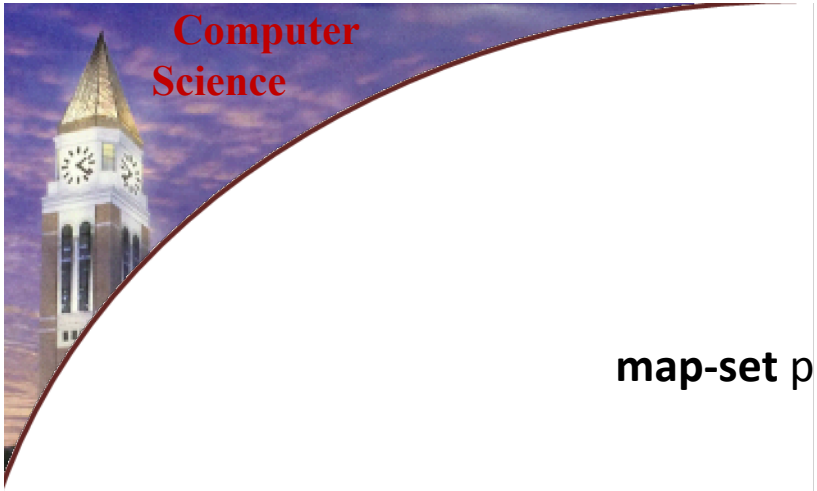

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(map-set (lambda(x) (+ x 42)) { 3, 7, 13})
you get the set of
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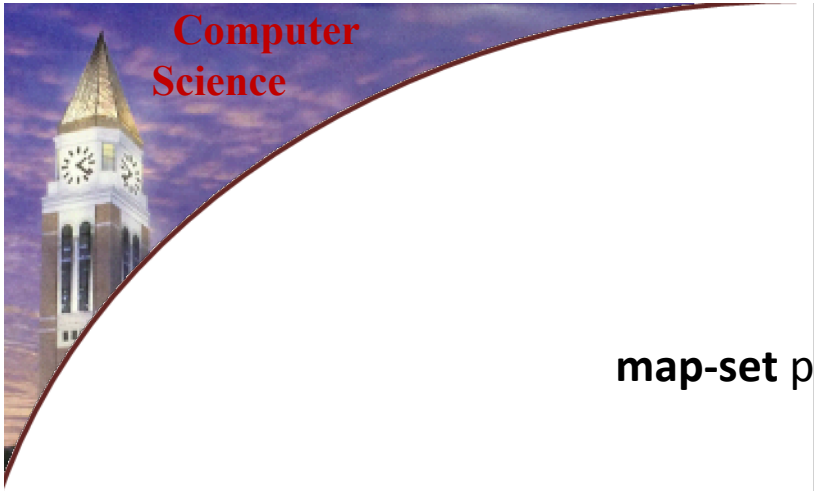

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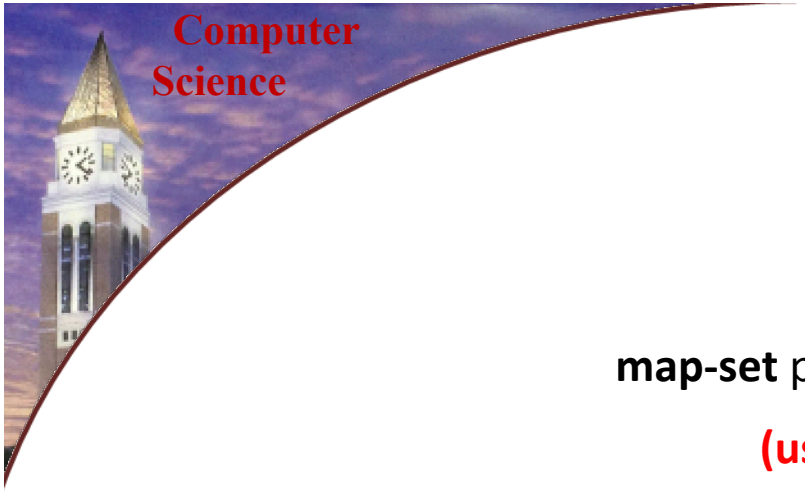

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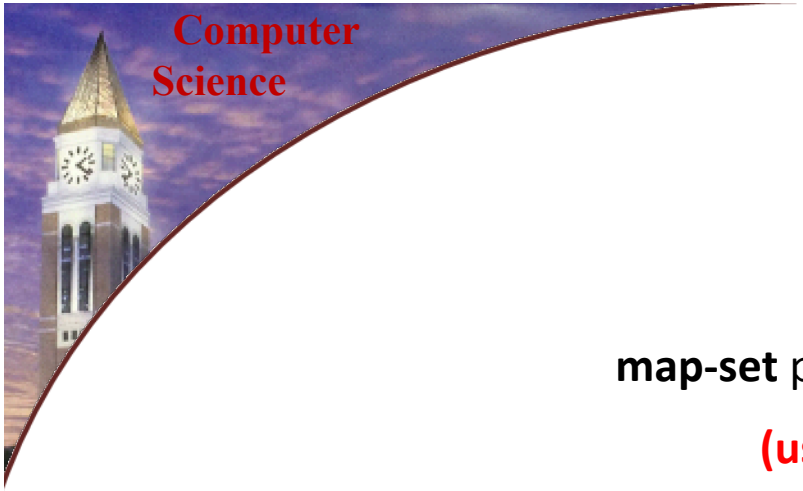

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(define (exists? predicate s)
  (define (test? x)
    (if (s x)
        (predicate x)
        #f
        )
    )
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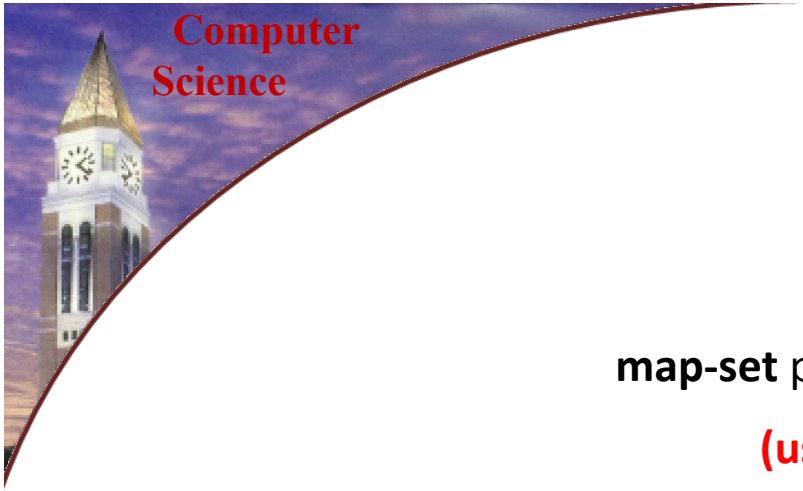
  )
```



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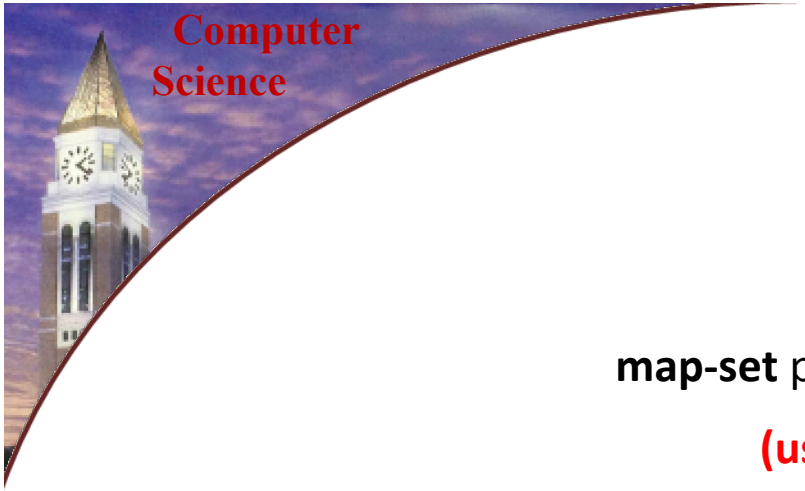

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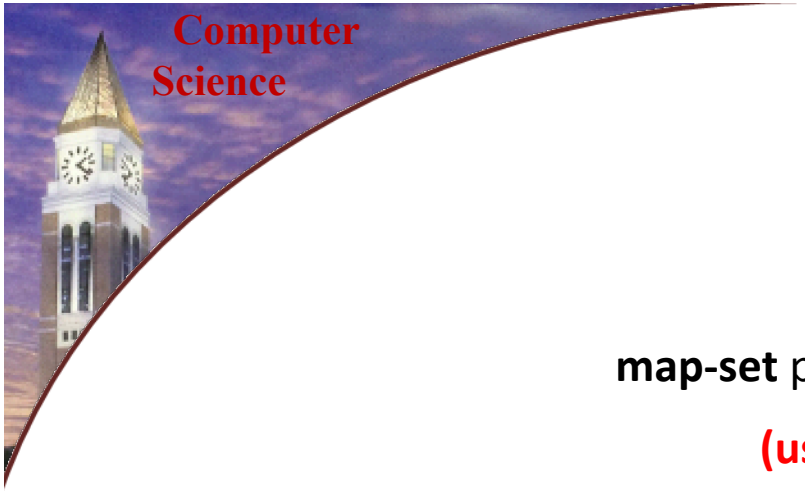

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```
(define (map-set op s)
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    )
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```

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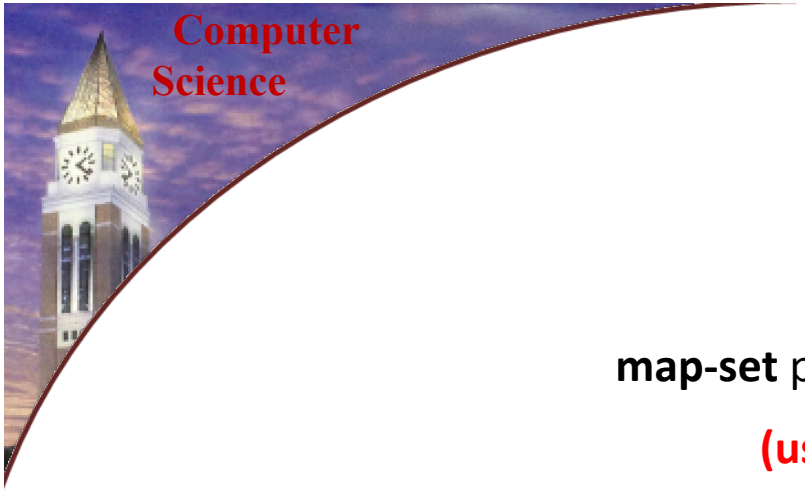

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Road Ahead -

HW05

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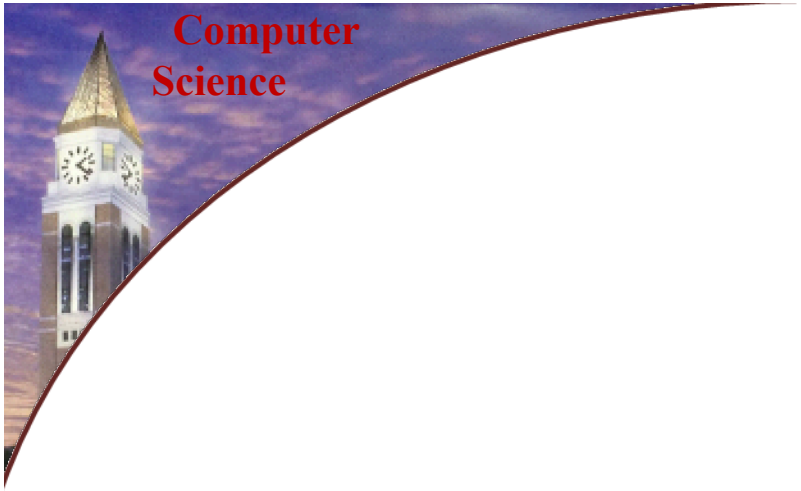

Exam 01

(The **`repeat`** loop problem)

HW 4

(Problem 2b)

```
(define-syntax-rule (while condition while-body)
  (letrec (
           (loop (lambda ()
                   (if (not condition)
                       0
                       ( seq while-body (loop) )
                       ))
                 )
           )
    (loop)
    )
  )
```

(1)

Data Type Definition (ADT)

- For complicated types, manual definition tedious
- Plant errors in data type definitions

an observation

- It has recipe!
  - Constructors, Predicates, Extractors

A Tool for Defining Data Types
(less grunt work!)

```
(#%require (lib "eopl.ss" "eopl"))
```

define-datatype

```
(define-datatype type-name predicate-name
  { (variant-name { (field-name predicate)}*)}+
```

define-datatype

```
Env ::= (empty-env )
        | (extend-env var val Env)
```

```
(define-datatype Env Env?
   (empty-env)
   (extend-env (var symbol?)(val number?)(env Env?))
)
```

name of the 2nd variant

name of the 1st field of the 2nd variant

name of the 2nd field of the 2nd variant

name of the 3rd field of the 2nd variant

define-datatype

```
Env ::= (empty-env )
        | (extend-env var val Env)
```

```
(define-datatype Env Env?
    (empty-env)
    (extend-env (var symbol?)(val number?)(Env Env?))
)
```

`var` needs to be of type `number`

`var` needs to be of type `symbol`

`Env` needs to be of type `Env`

What Do We Get?

```
(define-datatype Env Env?
   (empty-env)
   (extend-env (var symbol?)(val number?)(env Env?))
)
```

```
> (Env? #f)
#f
> (Env? (empty-env))
#t
> (Env? (extend-env 'x 20 (empty-env)))
#t
```

What Do We NOT Get?

```
(define-datatype Env Env?
    (empty-env)
    (extend-env (var symbol?)(val number?)(env Env?))
)
```

- We do NOT get
  - Extractors: `Env->var`, `Env->val`, `Env->env`
  - Predicates for variants: `empty-env?`, `extend-env?`

`cases` Syntax Abstraction

`cases` understands `define-datatype`

```
(define-datatype Env Env?
   (empty-env)
   (extend-env (var symbol?)(val number?)(env Env?))
)
```

```
(define apply-env
   (lambda (env search-var)
     (cases Env env)
       (empty-env () (report-no-binding-found search-var))
       (extend-env
          (saved-var saved-val saved-env)
            (if (eqv? search-var saved-var)
                 saved-val
                (apply-env saved-env search-var))))))
```

```
(define-datatype Env Env?
   (empty-env)
   (extend-env (var symbol?)(val number?)(env Env?))
)
```

```
(define (apply-env env search-var)
    (cases Env env
      (empty-env () (raise "No such variable found"))
      (extend-env
         (saved-var saved-val saved-env)
           (if (eqv? search-var saved-var)
               saved-val
               (apply-env saved-env search-var)))))
```