MULTI-METHODS IN RACKET

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STRUCTS

Generic Functions

```
(struct generic-function (name parameters)
    #:mutable #:property prop:procedure
    (lambda (f . params-list)
        (generic-function-protocol f params-list)))
```

Concrete Methods

```
(struct concrete-method (name types func)
    #:mutable)
```

GENERIC FUNCTION PROTOCOL

1. Finds applicable methods. If no method found returns an error.
2. Sorts methods found by their types. Calls the body of first method in that list.

FINDING APPLICABLE METHODS

- For each parameter we check if its applicable to the correspondent type-check method
- If all the matches from the parameters returned #t, the method is added to the list of applicable methods

SYNTAX RULES

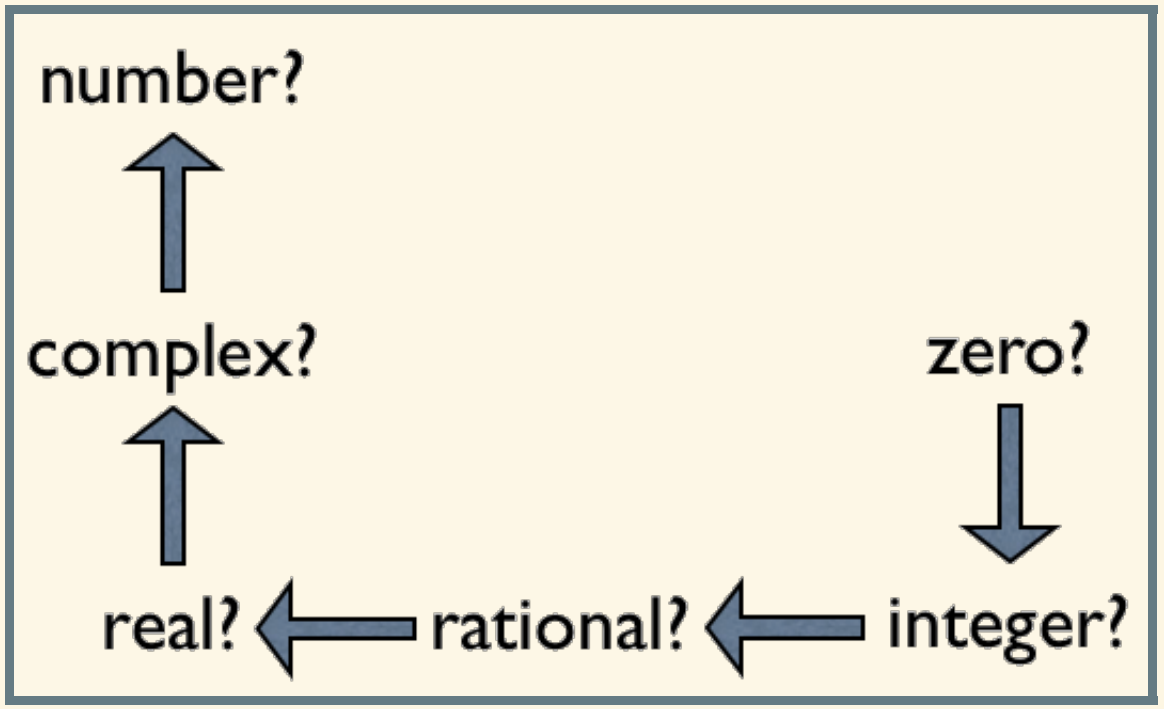
Generic Functions

```
(define-syntax defgeneric
    (syntax-rules ()
        [(defgeneric name (params ...))
            (begin
                (define name (generic-function 'name '(params ...)))
                (add-to generic-functions-table 'name (concrete-methods
-list)))]
```

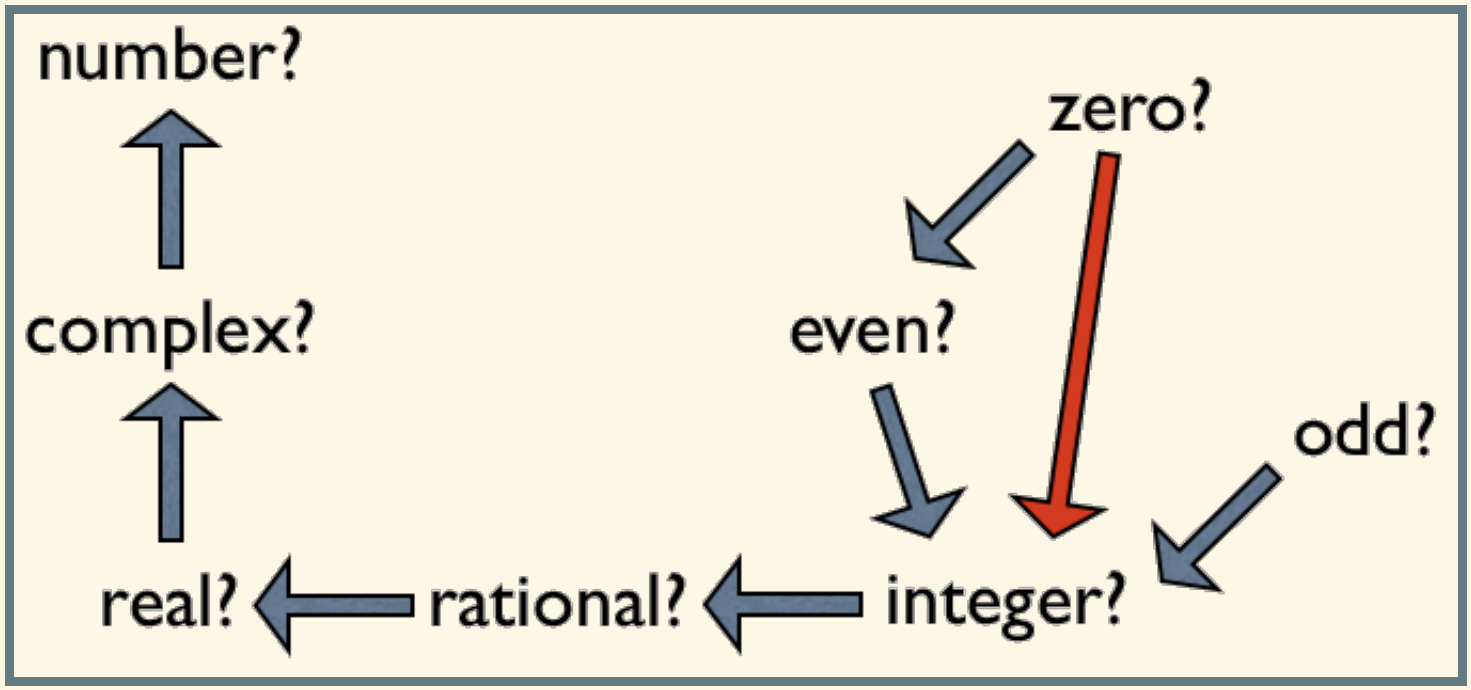
Concrete Methods

```
(define-syntax-rule
  (defmethod name ((params type) ...) body ...)
    (if (hash-has-key? concrete-methods-table method-key)
        (remove-method-from-concrete-list 'name concrete-methods-list))
    (add-to generic-functions-table 'name new-method concrete-methods-l
ist)
    (add-to concrete-methods-table method-key '(body ...)))
```

TYPE GRAPH

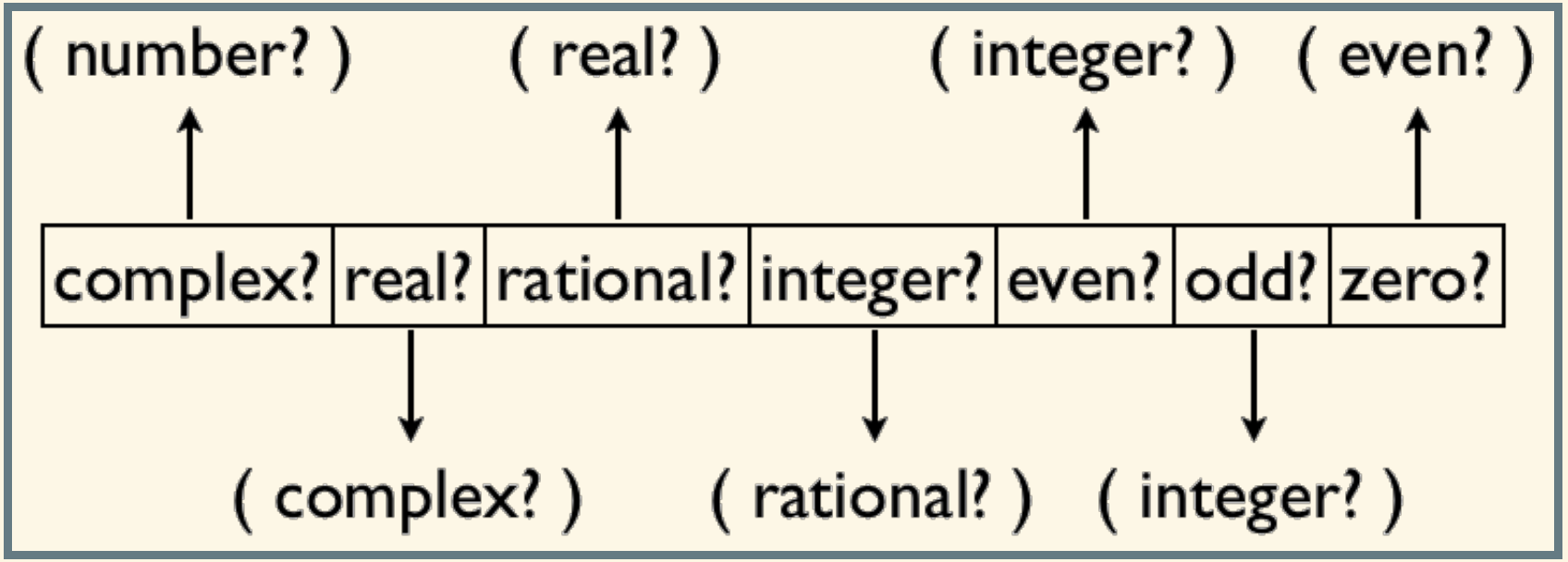


TYPE GRAPH



TYPE GRAPH

How it ended up



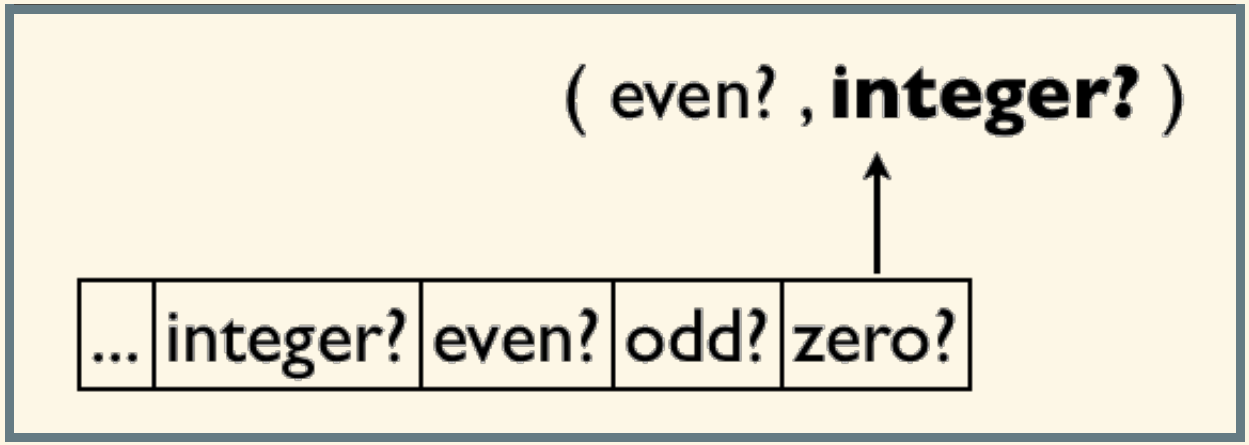
PARENT SEARCH

```
(define (check-possible-cycle child parent)
  (define (check-cycle-aux child parents-lst)
    (cond ((empty? parents-lst) #f)
          ((eq? child (first parents-lst)) #t)
          ((hash-has-key? type-graph
                          (first parents-lst))
                          (check-cycle-aux child (hash-ref type-graph (
first parents-lst))))
          (else (check-cycle-aux child (rest parents-lst)))))
  (and (hash-has-key? type-graph parent)
       (check-cycle-aux child (hash-ref type-graph parent))))
```

EXTENSIONS - WHAT CHANGED

```
(struct generic-function (name parameters args-order combination-proc)
...)

struct concrete-method (name types role func types-ordered combination-
proc) #:mutable)
```

MULTIPLE SUPER TYPES



Add to parents list

Add another recursive pass in Parent Search

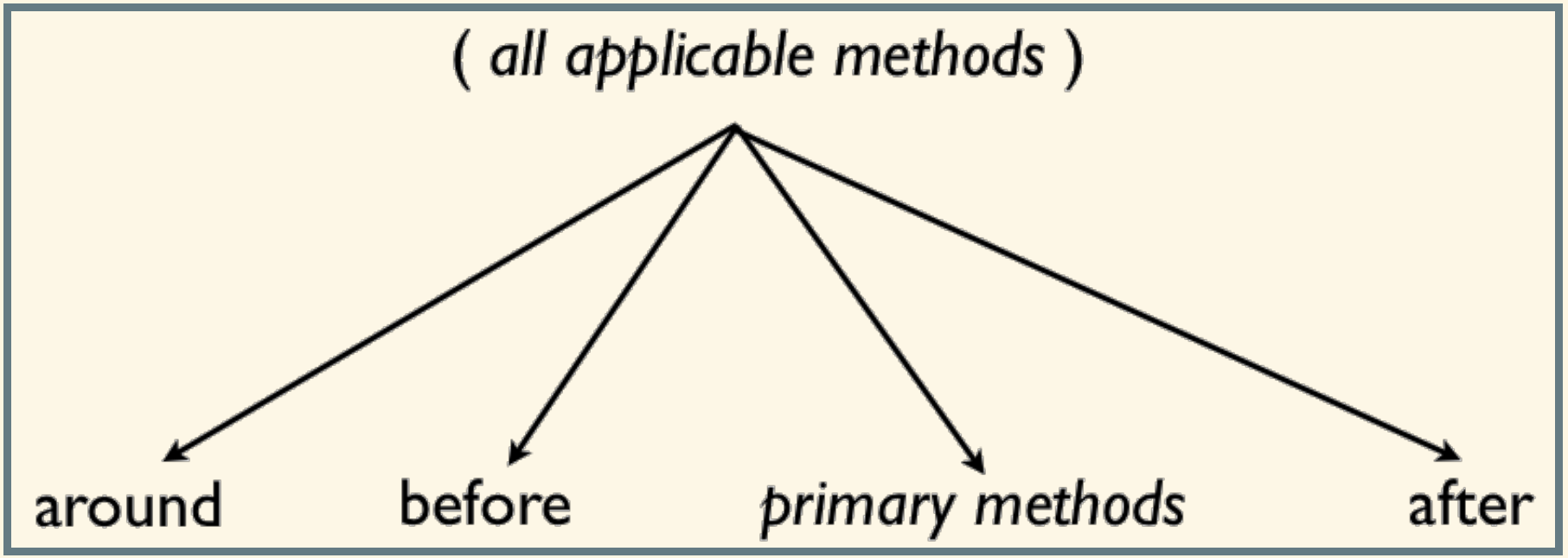
ARGUMENT PRECEDENCE ORDER

```
(defsubtype zero? number?)
(defgeneric showme (x y) #:argument-precedence-order y x)
(defmethod showme ((x zero?) (y number?)) (display "first"))
(defmethod showme ((x number?) (y zero?)) (display "second"))

(showme 2 0)
Result: second
(showme 0 2)
Result: first
```

METHOD COMBINATION

```
(defgeneric add (x y) #:method-combination list)
(defmethod add ((x number?) (y number?)) (+ x y))
(defmethod add ((x integer?) (y integer?)) (+ x y 10))
(defmethod add ((x integer?) (y zero?)) (+ x y 100))

(add 1 1)
Result: '(2 12)
(add 1 0)
Result: '(1 11 101)
```

ROLES



NEW METHOD ORDERING

From precedence-type ordering to precendence-type and role ordering

QUESTIONS?