Exam 3 Review

4 December 2020
Logistics
When?

Wednesday, December 16

Between 8:30 a.m. and 10:00 p.m. local time
How long?

The exam is designed to be about one hour long, but you have exactly two hours to take it.

(Excepting AEO accommodations)
What can you use?

One 8.5×11-inch piece of paper with anything written on it.

You will be asked to submit a copy of it.
Topics
Binary trees
Arbitrary trees
Graphs
Functions that work on multiple lists/trees
Intertwined definitions

Structural recursion
Generative recursion
Accumulators
Anything covered by Exam 1 or Exam 2
Binary trees
Arbitrary trees
Graphs
Functions that work on multiple lists/trees
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Anything covered by Exam 1 or Exam 2
Rapid-fire review
Is this a binary or arbitrary tree?
Is this a binary or arbitrary tree?

**Binary**
What’s the root of this tree?
What’s the root of this tree?

**Balbo / Berylla (Bilbo’s great-grandparents)**
What’s the height of this tree?
What’s the height of this tree?

3
What's the height of this tree?
What’s the height of *this* tree?
Is this still a binary tree?
Is this still a binary tree?

Yes!
Is this a valid graph?
Is this a valid graph?

Yes.
Is this a valid graph?

Yes.

They’re all valid graphs, Brent
How many neighbors does B have?
How many neighbors does B have?

Two.
How many neighbors does D have?
How many neighbors does D have?

Three.
(define GRAPH (list "a" "b" "c"))

Ok, seriously, is this a valid example of a graph?
Ok, seriously, is this a valid example of a graph?

Nah

(define GRAPH (list "a" "b" "c"))
Well, is this a valid example of a vertex?
Well, is this a valid example of a vertex?

(define VERTEX (list "a" "b" "c"))

Closer, but still no
(define VERTEX (make-vertex "d"
    (list "a" "b" "c")))

Is this a valid example of a vertex?
Is this a valid example of a vertex?

There you go!
A function that consumes two lists can process their elements sequentially or…

__________________
A function that consumes two lists can process their elements sequentially or... \textit{in parallel}
We implemented merge-sort using ______________ recursion.
We implemented merge-sort using 
generative recursion.
If a function subtracts 1 from a *Natural* with every recursive call, it’s using ______________ recursion.
If a function subtracts 1 from a \textit{Natural} with every recursive call, it's using \textit{structural} recursion.
If a function divides a Natural by 2 with every recursive call, it’s using ___________ recursion.

;; A Natural is one of:
;; – 1
;; – (add1 Natural)
If a function divides a *Natural* by 2 with every recursive call, it’s using **generative** recursion.

```scheme
;; A Natural is one of:
;; - 1
;; - (add1 Natural)
```
Is the function `cons` fast or slow?
Is the function cons fast or slow?

Fast!
Is the function `append` fast or slow?
Is the function **append** fast or slow?

Slow :-(
append is slow because it processes the elements in the lists ___________
append is slow because it processes the elements in the lists sequentially.
This exam is going to go ________.
This exam is going to go great! :-)

Acknowledgments

This lecture incorporates material from:

Laney Strange