CSE 341 — Racket Discussion Questions Part 3

These questions deal with macros, delayed evaluation, improper lists, and functions with a variable number of arguments.

1. The lecture notes for macros include a definition for `my-or` that works just like the built-in `or` in Racket.

   ```racket
   (define-syntax my-or
     (syntax-rules ()
       ((my-or) #f)
       ((my-or e1 e2 ...) (let ([temp e1])
                           (if temp temp (my-or e2 ...))))))
   
   Given this definition, if we expand `(my-or (= x 2))` we get
   ```
   (let ([temp (= x 2)]) (if temp temp (my-or)))
   ```
   This would further expand to
   ```
   (let ([temp (= x 2)]) (if temp temp #f))
   ```
   Modify the rule so it just expands `(my-or (= x 2))` to `(= x 2)` instead. It should still work correctly for `(my-or)`.

2. Suppose we are writing our own version of the `if` special form, called `my-if`. This can’t be a normal function in Racket, since we evaluate the arguments. We can write it as a macro, of course. For this mini-exercise, write it as a function that uses delay to delay evaluating some or all of the arguments. Only delay arguments if needed.
   Now rewrite the following expression using your `my-if` function. (All you need to do is insert the appropriate delays. Use Racket’s built-in delay macro.)
   ```racket
   (if (= 1 1) (+ 2 4) (/ 10 0))
   ```

3. Draw a box-and-arrow picture for the value of `(squid . (clam . (octopus . ()))))`

4. Draw a box-and-arrow picture for the value of `(squid . (clam . octopus))`

5. How would you write the following list structure in Scheme?

   ```text
   __________ __________
   |     |     /     |
   |  0  | ----|----->|  0 | ----|---->/  |
   |     |     |     |
   |___|___|_______|_______|______________|
   |     |     |
   |     | 1 2 3 4 |
   |_______|_______|
   ```
6. Write a function \texttt{my-max} that finds the maximum of its arguments. It needs at least one argument, and can take arbitrarily more. For example

\[(\texttt{my-max 4 10 2 1})\]

should return 10.

You can use a helper function if you need to. Bonus points though for a version without a helper function!

What do these evaluate to?

\[(\texttt{my-max 3})\]
\[(\texttt{my-max})\]