

CSSE 304, Worksheet, Closures and Environments.

Evaluate the following expressions, drawing closures and environments.
Enumerate the order in which closures and environments get generated.

```
((lambda (x) x) (lambda (y) y)) 4)
```

```
'(app-exp  
  (app-exp  
    (lambda-exp x (var-exp x))  
    (lambda-exp y (var-exp y)))  
  (lit-exp 4))
```

```
((lambda (x) (x 3)) (lambda (x) (+ x 1)))
```

```
'(app-exp  
  (lambda-exp x  
    (app-exp (var-exp x) (lit-exp 3)))  
  (lambda-exp x (app-exp (var-exp +) (var-exp x) (lit-exp 1))))
```

```
((lambda (x) ((lambda (x) (+ x 1)) (+ x 1))) 4)
```

```
'(app-exp  
  (lambda-exp x  
    (app-exp  
      (lambda-exp x (app-exp (var-exp +) (var-exp x) (lit-exp 1))  
        (app-exp (var-exp +) (var-exp x) (lit-exp 1))))  
    (lit-exp 4))
```

```
((lambda (x) ((x 1) 1))  
 (lambda (x) (lambda (y) (+ x y))))
```

```
'(app-exp  
  (lambda-exp x  
    (app-exp  
      (app-exp (var-exp x) (lit-exp 1)) (lit-exp 1)))  
  (lambda-exp x  
    (lambda-exp y  
      (app-exp (var-exp +) (var-exp x))))))
```