Extra Practice Problems (Module 1)

1. Translate the following into Racket functions:
   a. \( f(x, y, z) = x \cdot (y + 10) + \sqrt{z^2 - 4} \)

   Examples (Try these on your interactions window):
   - \((f \ 0 \ 0 \ 2) \rightarrow 0\)
   - \((f \ 10 \ 10 \ 0) \rightarrow 200 + 2i\)
   - \((f \ 0 \ 10 \ 2) \rightarrow 0\)
   - \((f \ -10 \ 0 \ 2) \rightarrow 100\)
   - \((f \ 0 \ 0 \ 10) \rightarrow \#i9.797958971132712\)

   b. \( g(x, y) = \frac{x^2 - y^2}{(x+4)^2} - 1 \)

   Examples:
   - \((g \ 0 \ 0) \rightarrow -1\)
   - \((g \ 1 \ 0) \rightarrow -0.96\)
   - \((g \ 10 \ -4) \rightarrow -0.571428\)
   - \((g \ -4 \ 10) \rightarrow /: \text{division by zero}\)

2. Write a function `extract-middle` to produce the middle digit from a three digit number.

   Examples:
   - \((\text{extract-middle 222}) =\ 2\)
   - \((\text{extract-middle 841}) =\ 4\)

3. Write a function called `remainder-fn` that consumes two natural numbers and produces the remainder of a number without using the remainder and quotient function introduced in class. Hint: section 1.5 of Racket documentation.

   Examples:
   - \((\text{remainder-fn 10 3}) =\ 1\)
   - \((\text{remainder-fn 5 5}) =\ 0\)

4. Using a constant for the total number of labs (12), given that the 1st lab is not for marks, write a function `lab-mark` that determines your total lab grade (out of 100) given the number of labs you passed. (if you passed 11 labs your lab-mark is 100)

   Examples:
   - \((\text{lab-mark 11}) =\ 100\)
   - \((\text{lab-mark 7}) =\ 63.63\ldots\)
   - \((\text{lab-mark 10}) =\ 90.90\ldots\)
   - \((\text{lab-mark 0}) =\ 0\)
5. Stepping Problems: for each function call, write out each step line by line.

a. 
(define (hello x y)
  (* x (+ y x 4) y))

(hello 6 3)

b. 
(define a 4)
(define b 5)
(define (f x)
  (* (+ 4 x) (+ 5 x)))

(+ (f a) (f b))