

# Theory of Computer Science

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## Exercise meeting 11

### Exercise 11.1 (WHILE Programs)

Which unary function does the following WHILE-program compute?

```
 $x_2 := 1;$   
 $x_3 := 0;$   
WHILE  $x_2 \neq 0$  DO  
  IF  $x_1 = x_3$  THEN  
     $x_2 := 0$   
  END;  
   $x_3 := x_3 + 2$   
END;  
 $x_0 := 1$ 
```

### Exercise 11.2 (WHILE Programs)

- (a) Specify a WHILE program that computes the following function:

$$f(x, y) = \begin{cases} \lfloor x/y \rfloor, & \text{if } y > 0 \\ \text{undefined}, & \text{otherwise} \end{cases}$$

You can use that  $\lfloor a/b \rfloor = \lceil (a - (b - 1))/b \rceil$  for  $b > 0$ .

- (b) Specify a WHILE-program which computes the modulo operation

$$g(x, y) = \begin{cases} x \bmod y, & \text{if } y > 0 \\ \text{undefined}, & \text{otherwise.} \end{cases}$$

You may use the function  $f$  from exercise (a) and the multiplication  $\cdot$  in your solution.