PI2 WE-Übungsblatt 1

Aufgabe 1

```
maximum :: [Double] -> Double
maximum [] = error "no maximum of empty list"
maximum [x] = x
maximum (x:y:xs) | x>y       = max (x:xs)
                 | otherwise = max (y:xs)

rgb2cymk :: (Int,Int,Int) -> (Double,Double,Double,Double)
rgb2cymk (0,0,0) = (0.0,0.0,0.0,1.0)
rgb2cymk (r,g,b) = (c,m,y,k)
                   where
                   w = maximum [rd/255.0, gd/255.0, bd/255.0]
                   c = (w-(rd/255.0))/w
                   m = (w-(gd/255.0))/w
                   y = (w-(bd/255.0))/w
                   k = 1.0-w
                   rd = fromIntegral r
                   gd = fromIntegral g
                   bd = fromIntegral b
```

Aufgabe 2

```
minNeighborsDistance :: [Int] -> Int
minNeighborsDistance (x:y:xs) = fst (mnd (abs (x-y) ,xs))
                                where
                                mnd :: (Int,[Int]) -> (Int,[Int])
                                mnd (m,[])       = (m,[])
                                mnd (m,[x])      = (m,[x])
                                mnd (m,(x:y:xs)) | dist<m   = mnd (dist,(y:xs))
                                                 | otherwise = mnd (m,(y:xs))
                                                   where dist = abs (x-y)
minNeighborsDistance _        = error "list needs at least 2 elements"
```

Aufgabe 3

```
smap :: Int -> Int -> (Int -> Double) -> Double
smap s n func = sum (map func [s..n])

bla :: Int -> Double
bla k = 4.0*(-1.0)^k/(2.0*(fromIntegral k)+1.0)
```

```
piappr :: Int -> Double
piappr n = smap 0 n bla
```

Aufgabe 4

```
echtTeiler :: Int -> [Int]
echtTeiler n = [ a | a <- [1..n-1], n`mod`a==0 ]
```

Aufgabe 5

```
mysum :: [Int] -> Int
mysum []     = 0
mysum (x:xs) = x+(mysum xs)

amicable :: Int -> Int -> Bool
amicable n m | n == m    = False
             | otherwise = n == mysum (echtTeiler m) && m == mysum (echtTeiler n)
```

Aufgabe 6

```
nextCollatz :: Int -> Int
nextCollatz n | n`mod`2 == 0 = n`div`2
              | otherwise    = n*3+1

collatzSeq :: Int -> [Int]
collatzSeq 1 = [1]
collatzSeq n = n:collatzSeq (nextCollatz n)

collatzSeqs :: Int -> [[Int]]
collatzSeqs n = [ collatzSeq a | a <- [1..n] ]
```

Aufgabe 7

```
square :: (Int, Int, Int) -> Char
square (x,y,s) = if y>x
                    then if x>(-y)+s
                         then 'B'
                         else '.'
                    else if (y<n || y>2*n && y<m) && (x>m) || (x>m+2*n || x>m &&
x<m+n ) && y<m
                         then '*'
                         else ' '
                         where
                         m = s`div`2
                         n = s`div`6
```

```
chessboard :: (Int, Int, Int) -> Char
chessboard (x,y,s) = if (y-1)`mod`8<4 && (x-1)`mod`8<4 || (y-1)`mod`8>=4 &&
(x-1)`mod`8>=4
                     then '▄▬^'
                     else ' '

circ :: Int -> Int -> Int -> Double
circ x y r = ( ((xd-rd)/rd)^2 + ((yd-rd)/rd)^2 )
             where
             xd = fromIntegral x
             yd = fromIntegral y
             rd = fromIntegral r

easteregg :: (Int, Int, Int) -> Char
easteregg (x,y,s) = if 1.0 > (circ x y m)
                    then if x<m
                         then if y`mod`6==0 && x`mod`3==0
                              then '@'
                              else '_'
                         else if y`mod`8<4
                              then '▄▬^'
                              else '='
                    else if x>m+m`div`2
                         then '|'
                         else ' '
                    where
                    m = s`div`2
                    r = (fromIntegral s)/2.0
                    xd = fromIntegral x
                    yd = fromIntegral y

smiley :: (Int, Int, Int) -> Char
smiley (x,y,s) = if 1.0 > (circ x y m) && 0.8 < (circ x y m)
                 then '|'
                 else if 1.0 > (circ (x-a) (y-b) r3)
                         || 1.0 > (circ (x-a) (y-3*b) r3)
                      then '@'
                      else if 1.0 > (circ (x-c) (y-d) r4)
                              && x>m+m`div`3 && 0.7 < (circ (x-c) (y-d) r4)
                           then '='
                           else ' '
                 where
                 m = s`div`2
                 a = s`div`4
                 b = s`div`5
                 c = s`div`8
                 d = s`div`7
                 r3 = s`div`10
                 r4 = m`div`10*9
```