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HW_08

Question 1

```
sum [] = 0
sum x::xs -> x + sum xs

take 0 lst = [ ]
take n [ ] = [ ]
take n (x::xs) = x::take (n-1) xs

some_squares_from 0 v = [ ]
some_squares_from n v = v*v :: some_squares_from (n-1) (v+1)
```

Lazy evaluation:

```
  sum (take 3 (some_squares_from 5 1))
=sum (take 3 (1*1::some_squares_from (5-1) (1+1)))
=sum (1*1::take (3-1) (some_squares_from (5-1) (1+1)))
=1*1 + sum(take (3-1) (some_squares_from (5-1) (1+1)))
=1 + sum(take (3-1) (some_squares_from (5-1) (1+1)))
=1 + sum(take 2 (some_squares_from (5-1) (1+1)))
=1 + sum(take 2 (some_squares_from 4 (1+1)))
=1 + sum(take 2 (v1*v1::some_squares_from (4-1) (v1+1))),where v1=1+1
=1 + sum( (v1*v1:: take (2-1) (some_squares_from (4-1) (v1+1)))),where v1=1+1
=1 + (v1*v1 + sum (take (2-1) (some_squares_from (4-1) (v1+1)))),where v1=1+1
=1 + (2*2 + sum (take (2-1) (some_squares_from (4-1) (2+1))))
=1 + (4 + sum (take (2-1) (some_squares_from (4-1) (2+1))))
=1 + (4 + sum (take 1 (some_squares_from (4-1) (2+1))))
=1 + (4 + sum (take 1 (some_squares_from 3 (2+1))))
=1 + (4 + sum (take 1 (v2*v2::some_squares_from (3-1) (v2+1)))),where v2 = 2+1
=1 + (4 + sum (v2*v2:: take (1-1) (some_squares_from (3-1) (((1+1)+1)+1)))),where v2 = 2+1
=1 + (4 + (v2*v2 + sum (take (1-1) (some_squares_from (3-1) (v2+1))))),where v2 = 2+1
```

=1 + (4 + (3*3 + sum (take (1-1) (some_squares_from (3-1) (3+1)))))))

=1 + (4 + (9 + sum (take (1-1) (some_squares_from (3-1) ((3+1)))))))

=1 + (4 + (9 + sum (take 0 (some_squares_from (3-1) (3+1)))))))

=1 + (4 + (9 + sum ([])))

=1 + (4 + (9 + 0))

=1 + (4 + 9)

=1 + 13

=14

Call by value:

  sum (take 3 (some_squares_from 5 1))

=sum (take 3 (1*1::some_squares_from (5-1) (1+1))

=sum (take 3 (1*1::some_squares_from 4 (1+1))

=sum (take 3 (1*1::some_squares_from 4 2)

=sum (take 3 (1::some_squares_from 4 2)

=sum (take 3 (1::2*2::some_squares_from (4-1) (2+1))

=sum (take 3 (1::2*2::some_squares_from 3 (2+1))

=sum (take 3 (1::2*2::some_squares_from 3 3)

=sum (take 3 (1::4::some_squares_from 3 3)

=sum (take 3 (1::4::3*3::some_squares_from (3-1) (3+1))

=sum (take 3 (1::4::3*3::some_squares_from 2 (3+1))

=sum (take 3 (1::4::3*3::some_squares_from 2 4)

=sum (take 3 (1::4::9::some_squares_from 2 4)

=sum (take 3 (1::4::9::4*4::some_squares_from (2-1) (4+1))

=sum (take 3 (1::4::9::4*4::some_squares_from 1 (4+1))

=sum (take 3 (1::4::9::4*4::some_squares_from 1 5)

=sum (take 3 (1::4::9::16::some_squares_from 1 5)

=sum (take 3 (1::4::9::16::5*5::some_squares_from (1-1) (5+1)))

=sum (take 3 (1::4::9::16::5*5::some_squares_from 0 (5+1)))

=sum (take 3 (1::4::9::16::5*5::some_squares_from 0 6))

=sum (take 3 (1::4::9::16::25::some_squares_from 0 6))

=sum (take 3 (1::4::9::16::25::[]))

=sum (1::take (3-1) (4::9::16::25::[]))

=sum (1::take 2 (4::9::16::25::[]))

=sum (1::4::take (2-1) (9::16::25::[]))

=sum (1::4::take 1 (9::16::25::[]))

=sum (1::4::9::take (1-1) (16::25::[]))

=sum (1::4::9::take 0 (16::25::[]))

=sum (1::4::9::[])

=1 +sum (4::9::[])

=1 + (4 + sum (9::[]))

=1 + (4 + (9 + sum ([])))

=1 + (4 + (9 + 0))

=1 + (4 + 9)

=1 + 13

=14

Call by name:

sum (take 3 (some_squares_from 5 1))

=sum (take 3 (1*1::some_squares_from (5-1) (1+1)))

=sum (1*1::take (3-1) (some_squares_from (5-1) (1+1)))

=1*1 + sum(take (3-1) (some_squares_from (5-1) (1+1)))

=1 + sum(take (3-1) (some_squares_from (5-1) (1+1)))

=1 + sum(take 2 (some_squares_from (5-1) (1+1)))

=1 + sum(take 2 (some_squares_from 4 (1+1)))

=1 + sum(take 2 ((1+1)*(1+1)::some_squares_from (4-1) ((1+1)+1)))

=1 + sum(((1+1)*(1+1):: take (2-1) (some_squares_from (4-1) ((1+1)+1))))

=1 + ((1+1)*(1+1) + sum (take (2-1) (some_squares_from (4-1) ((1+1)+1)))))

=1 + (2*(1+1) + sum (take (2-1) (some_squares_from (4-1) ((1+1)+1)))))

=1 + (2*2 + sum (take (2-1) (some_squares_from (4-1) ((1+1)+1)))))

=1 + (4 + sum (take (2-1) (some_squares_from (4-1) ((1+1)+1)))))

=1 + (4 + sum (take 1 (some_squares_from (4-1) ((1+1)+1)))))

=1 + (4 + sum (take 1 (some_squares_from 3 ((1+1)+1)))))

=1 + (4 + sum (take 1 (((1+1)+1))*((1+1)+1))::some_squares_from (3-1) (((1+1)+1)+1)))))

=1 + (4 + sum (((1+1)+1))*((1+1)+1)):: take (1-1) (some_squares_from (3-1) (((1+1)+1)+1)))))

=1 + (4 + (((1+1)+1)*((1+1)+1) + sum (take (1-1) (some_squares_from (3-1) (((1+1)+1)+1)))))))

=1 + (4 + ((2+1)*((1+1)+1) + sum (take (1-1) (some_squares_from (3-1) (((1+1)+1)+1)))))))

=1 + (4 + (3*((1+1)+1) + sum (take (1-1) (some_squares_from (3-1) (((1+1)+1)+1)))))))

=1 + (4 + (3*(2+1) + sum (take (1-1) (some_squares_from (3-1) (((1+1)+1)+1)))))))

=1 + (4 + (3*3 + sum (take (1-1) (some_squares_from (3-1) (((1+1)+1)+1)))))))

=1 + (4 + (9 + sum (take (1-1) (some_squares_from (3-1) (((1+1)+1)+1)))))))

=1 + (4 + (9 + sum (take 0 (some_squares_from (3-1) (((1+1)+1)+1)))))))

=1 + (4 + (9 + sum ([])))

=1 + (4 + (9 + 0))

=1 + (4 + 9)

=1 + 13

=14