

Extending the Ackermann function

Aresh Pourkavoos

February 22, 2022

Interpret arguments as coefficients of powers of ω : original function accepts ordinal $< \omega^2$

$$A(n) = n + 1$$

$$A(\omega(m + 1)) = A(\omega m + 1)$$

$$A(\omega(m + 1) + (n + 1)) = A(\omega m + A(\omega(m + 1) + n))$$

X : (possibly empty) list of naturals Y : (possibly empty) list of zeros a, b : naturals

$$A(a) = a + 1$$

$$A(0, X) = A(X)$$

$$A(X, b + 1, Y, 0) = A(X, b, Y, 1)$$

$$A(X, b + 1, Y, a + 1) = A(X, b, Y, A(X, b + 1, Y, a))$$

$$A(2, 0, 0) = A(1, 0, 1) = A(1, 0, A(0, 0, 1)) = A(1, 0, A(1)) = A(1, 0, 2) = A(0, 0, A(1, 0, 1)) = A(A(1, 0, 1))A(A(0, 0, A(1, 0, 0)))$$