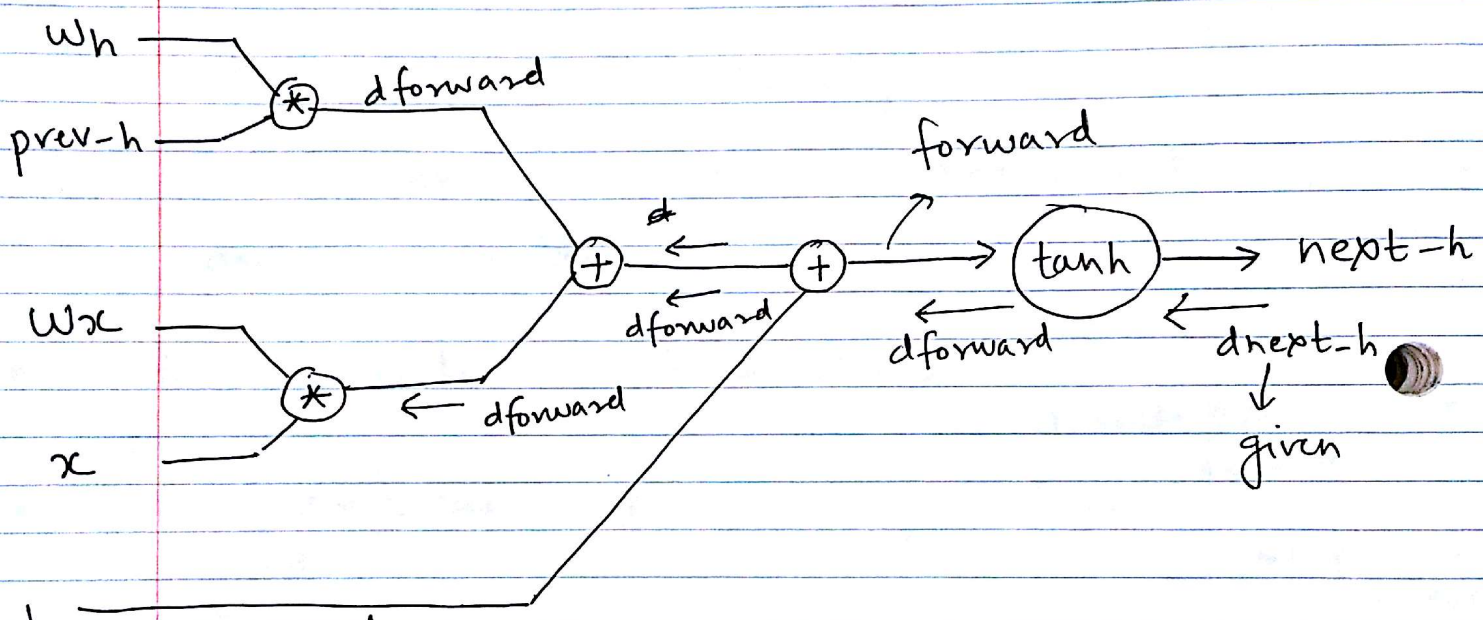
Forward / Backward pass for RNN

Let's look at the eqn first.

$$next\_h = \tanh\left(W_h * prev\_h + W_x * x\right) + b$$

We will draw it the Karpathy Andrej way



now forward pass as always is simple calculate forward and then tanh(forward) will give us next-h

now to backward.

$$\frac{\partial}{\partial x}\tanh(x) = \left(1 - \tan^2 h(x)\right)$$

$$dforward = \left(1 - \tan^2 h(x)\right) * dnext\_h$$

now ⊕ will just distribute the gradient hence

$db = dforward$.

now ⊛ will just switch the value and multiply with dforward. hence.

I mean for eg $\frac{\partial}{\partial x} xy = y$ $\frac{\partial}{\partial y} xy = x$

So $dw_h = prev\text{-}h * dforward$

$dprev\text{-}h = w_h * dforward$

$dw_x = x * dforward$

$dx = w_x * dforward$

} and we obviously have to look at dims please look at code for that

hence proved