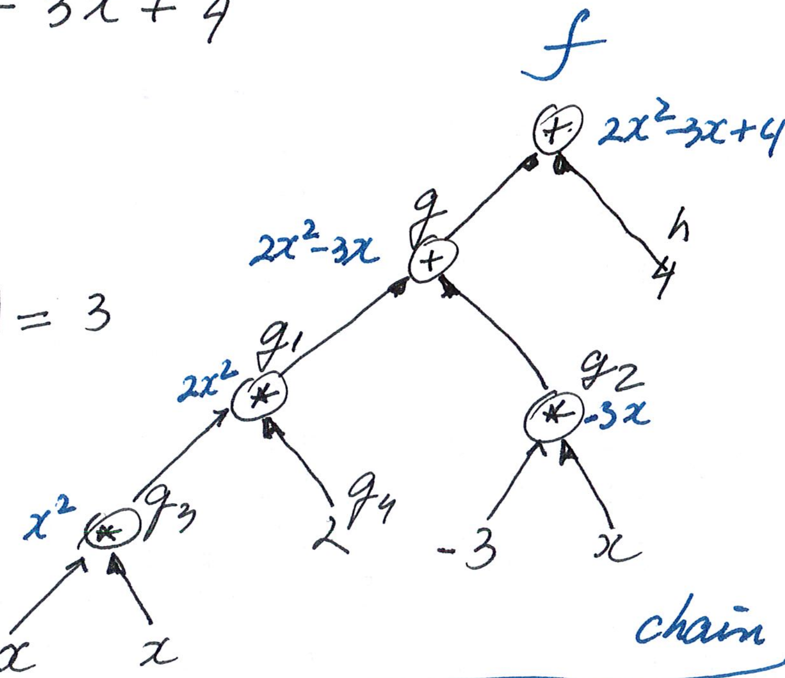
$$f(x) = 2x^2 - 3x + 4$$

$$f'(x) = \frac{\partial f}{\partial x} = 4x - 3$$

forward pass

$$f(1) = 3$$



$x = 1$

backward() pass

$$f'(1) = 1$$

$$\text{add}(x, y) = x + y$$

chain rule of differentiation

$$f = \text{add}(g, h)$$

$$\frac{\partial f}{\partial x} = \frac{\partial\, \text{add}}{\partial g} \cdot \frac{\partial g}{\partial x} + \frac{\partial\, \text{add}}{\partial h} \cdot \frac{\partial h}{\partial x}$$

$$= 1 \cdot \frac{\partial g}{\partial x} + 1 \cdot 0 = \frac{\partial g}{\partial x} = 4x - 3$$

$$g = \text{add}(g_1, g_2) \rightarrow \frac{\partial g}{\partial x} = \frac{\partial g_1}{\partial x} + \frac{\partial g_2}{\partial x} = 4x - 3$$

$$\frac{\partial g_2}{\partial x} \rightarrow -3$$

$$\frac{\partial g_1}{\partial x} \rightarrow \frac{\partial\, \text{mul}}{\partial g_3} \frac{\partial g_3}{\partial x} + \frac{\partial\, \text{mul}}{\partial g_4} \cdot \frac{\partial g_4}{\partial x} = 2 \cdot 2x + g_3 \cdot 0 = 4x$$

$$\underline{loss} = e + \underline{r} = \underbrace{(w_0 + w_1)^2}_{e} + \underbrace{(2w_0 - 1)}_{r}$$

$w_0 = 1$

$w_1 = 2$

$$\frac{\partial loss}{\partial w_0} = 2\underbrace{(w_0 + w_1)}_{3} + 2 = 8$$

$$\frac{\partial loss}{\partial w_1} = 2(w_0 + w_1) = 6$$

$$\frac{\partial loss}{\partial r} = 1$$