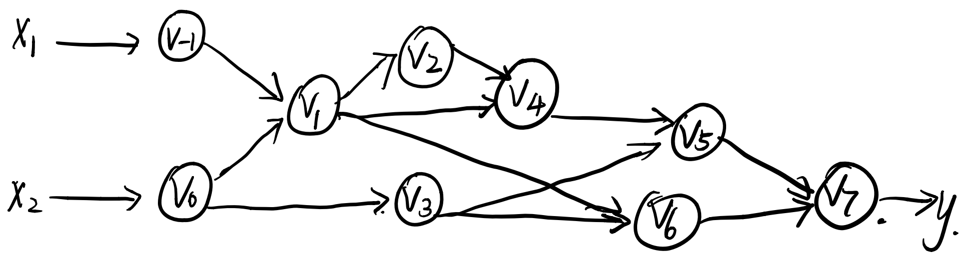
1. $y(x) = \left(\sin\frac{x_1}{x_2} + \frac{x_1}{x_2} - \exp(x_2)\right)\left(\frac{x_1}{x_2} - \exp(x_2)\right).$

(i).



Forward Evaluation Trace.

$$v_{-1} = x_1 = 1.5$$

$$v_0 = x_2 = 0.5.$$

$$v_1 = \frac{x_1}{x_2} = 3.$$

$$v_2 = \sin\frac{x_1}{x_2} = \sin 3.$$

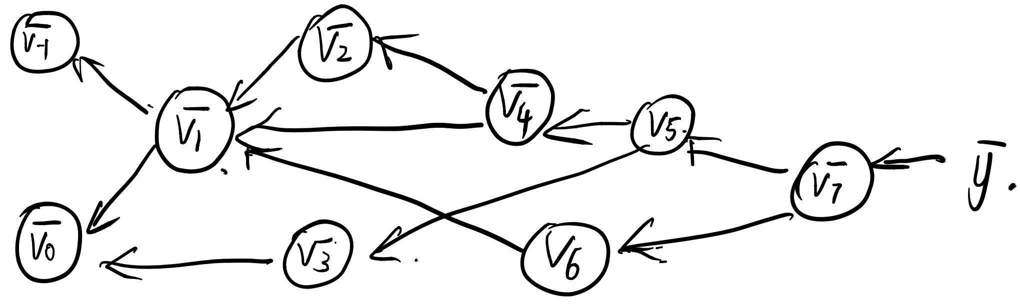
$$v_3 = \exp(x_2) = e^{\frac{1}{2}}.$$

$$v_4 = v_1 + v_2 = \frac{x_1}{x_2} + \sin\frac{x_1}{x_2} = 3 + \sin 3.$$

$$v_5 = v_4 - v_3 = 3 + \sin 3 - e^{\frac{1}{2}}.$$

$$v_6 = v_1 - v_3 = \frac{x_1}{x_2} - \exp(x_2) = 3 - e^{\frac{1}{2}}.$$

$$v_7 = v_5 * v_6 = (3 + \sin 3 - e^{\frac{1}{2}})(3 - e^{\frac{1}{2}}).$$



Reverse Adjoint trace: $v_{-1} = v_{-1} + \bar{v}_1 \frac{\partial v_1}{\partial v_{-1}}$.

$\bar{v}_0 = \bar{v}_0 + \bar{v}_1 \frac{\partial v_1}{\partial v_0}$

$\bar{v}_1 = \bar{v}_2 \cdot \frac{\partial v_2}{\partial v_1} = \bar{v}_2 \cdot \cos \bar{v}_2 = (3 - e^{\frac{1}{2}}) \cos(3 - e^{\frac{1}{2}})$

$\bar{v}_2 = \bar{v}_4 \cdot \frac{\partial v_4}{\partial v_2} = \bar{v}_4 \cdot 1 = 3 - e^{\frac{1}{2}}$.

$\bar{v}_3 = \bar{v}_5 \cdot \frac{\partial v_5}{\partial v_3} = \bar{v}_5 \cdot (-1) = e^{\frac{1}{2}} - 3$.

$\bar{v}_4 = \bar{v}_5 \cdot \frac{\partial v_5}{\partial v_4} = \bar{v}_5 \cdot 1 = 3 - e^{\frac{1}{2}}$.

$\bar{v}_5 = \bar{v}_7 \cdot \frac{\partial v_7}{\partial v_5} = \bar{v}_7 \cdot v_6 = 3 - e^{\frac{1}{2}}$.

$\bar{v}_6 = \bar{v}_7 \cdot \frac{\partial v_7}{\partial v_6} = \bar{v}_7 \cdot v_5 = 3 + \sin 3 - e^{\frac{1}{2}}$.

$\bar{v}_7 = \bar{y} = 1$.