532s - A1

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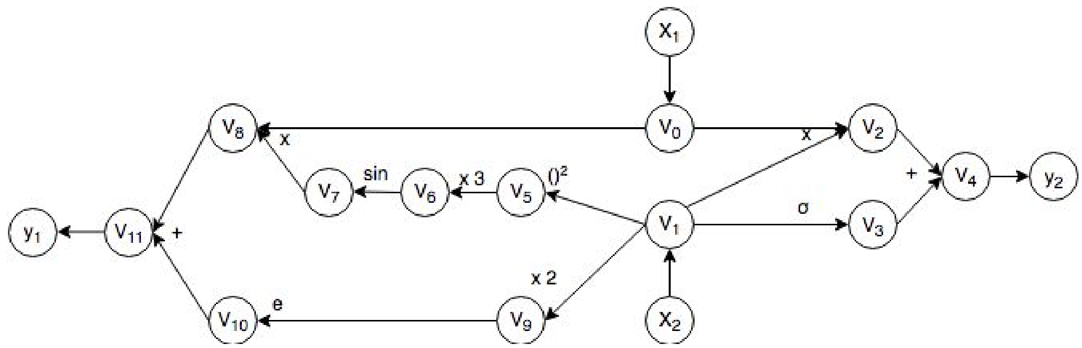
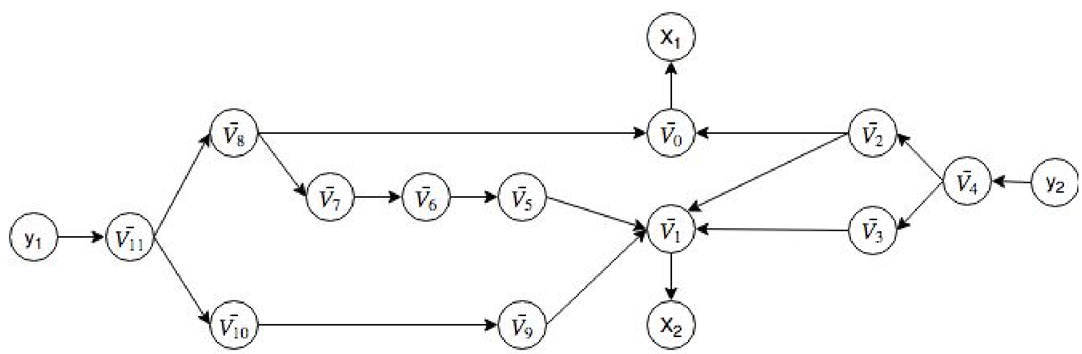
Problem 1

a



b



c

V_0	x_1	2	V_6	$3V_5$	3
V_1	x_2	1	V_7	$\sin(V_6)$	$\sin(3)$
V_2	V_0V_1	2	V_8	V_0V_7	$2\sin(3)$
V_3	$\sigma(V_1)$	$\sigma(1)$	V_9	$2V_1$	2
V_4	V_2+V_3	$2+\sigma(1)$	V_{10}	e^{V_9}	e^2
y_2	V_4	$2+\sigma(1)$	V_{11}	V_8+V_{10}	$e^2+2\sin(3)$
V_5	V_1^2	1 y_1	V_{11}	$e^2+2\sin(3)$	

$$y_1 = e^2 + 2\sin 3,\ y_2 = 2 + \sigma(1)$$

d

$\frac{\partial V_0}{\partial x_1}$	1	1	$\frac{\partial V_6}{\partial x_1}$	$3\frac{\partial V_5}{\partial x_1}$	0
$\frac{\partial V_0}{\partial x_2}$	0	0	$\frac{\partial V_6}{\partial x_2}$	$3\frac{\partial V_5}{\partial x_2}$	6
$\frac{\partial V_1}{\partial x_1}$	0	0	$\frac{\partial V_7}{\partial x_1}$	$\frac{\partial V_6}{\partial x_1}\cos V_6$	0
$\frac{\partial V_1}{\partial x_2}$	1	1	$\frac{\partial V_7}{\partial x_2}$	$\frac{\partial V_6}{\partial x_2}\cos V_6$	$6\cos 3$
$\frac{\partial V_2}{\partial x_1}$	$\frac{\partial V_0}{\partial x_1}V_1 + V_0\frac{\partial V_1}{\partial x_1}$	1	$\frac{\partial V_8}{\partial x_1}$	$\frac{\partial V_0}{\partial x_1}V_7 + V_0\frac{\partial V_7}{\partial x_1}$	$\sin 3$
$\frac{\partial V_2}{\partial x_2}$	$\frac{\partial V_0}{\partial x_2}V_1 + V_0\frac{\partial V_1}{\partial x_2}$	2	$\frac{\partial V_8}{\partial x_2}$	$\frac{\partial V_0}{\partial x_2}V_7 + V_0\frac{\partial V_7}{\partial x_2}$	$12\cos 3$
$\frac{\partial V_3}{\partial x_1}$	$\frac{\partial V_1}{\partial x_1}\sigma'(V_1)$	0	$\frac{\partial V_9}{\partial x_1}$	$2\frac{\partial V_1}{\partial x_1}$	0
$\frac{\partial V_3}{\partial x_2}$	$\frac{\partial V_1}{\partial x_2}\sigma'(V_1)$	$\sigma'(1)$	$\frac{\partial V_9}{\partial x_2}$	$2\frac{\partial V_1}{\partial x_2}$	2
$\frac{\partial V_4}{\partial x_1}$	$\frac{\partial V_2}{\partial x_1} + \frac{\partial V_3}{\partial x_1}$	1	$\frac{\partial V_{10}}{\partial x_1}$	$\frac{\partial V_9}{\partial x_1}e^{V_9}$	0
$\frac{\partial V_4}{\partial x_2}$	$\frac{\partial V_2}{\partial x_2} + \frac{\partial V_3}{\partial x_2}$	$2+\sigma'(1)$	$\frac{\partial V_{10}}{\partial x_2}$	$\frac{\partial V_9}{\partial x_2}e^{V_9}$	$2e^2$
$\frac{\partial y_2}{\partial x_1}$	$\frac{\partial V_4}{\partial x_1}$	1	$\frac{\partial V_{11}}{\partial x_1}$	$\frac{\partial V_8}{\partial x_1} + \frac{\partial V_{10}}{\partial x_1}$	$\sin 3$
$\frac{\partial y_2}{\partial x_2}$	$\frac{\partial V_4}{\partial x_2}$	$2+\sigma'(1)$	$\frac{\partial V_{11}}{\partial x_2}$	$\frac{\partial V_8}{\partial x_2} + \frac{\partial V_{10}}{\partial x_2}$	$12\cos 3 + 2e^2$
$\frac{\partial V_5}{\partial x_1}$	$2\frac{\partial V_1}{\partial x_1}$	0	$\frac{\partial y_1}{\partial x_1}$	$\frac{\partial V_{11}}{\partial x_1}$	$\sin 3$
$\frac{\partial V_5}{\partial x_2}$	$2\frac{\partial V_1}{\partial x_2}$	2	$\frac{\partial y_1}{\partial x_2}$	$\frac{\partial V_{11}}{\partial x_2}$	$12\cos 3 + 2e^2$

$$J = \begin{bmatrix} \sin(3) & 12\cos 3 + 2e^2 \\ 1 & 2+\sigma'(1) \end{bmatrix}$$

e

$\bar{V_{11}}$	$\frac{\partial y_1}{\partial V_{11}}$	1
$\bar{V_{10}}$	$\bar{V_{11}}\frac{\partial V_{11}}{\partial V_{10}}$	1
$\bar{V_9}$	$\bar{V_{10}}\frac{\partial V_{10}}{\partial V_9} = e^{V_9}$	e^2
$\bar{V_8}$	$\bar{V_{11}}\frac{\partial V_{11}}{\partial V_8}$	1
$\bar{V_7}$	$\bar{V_8}\frac{\partial V_8}{\partial V_7} = V_0$	2
$\bar{V_6}$	$\bar{V_7}\frac{\partial V_7}{\partial V_6} = 2\cos(V_6)$	$2\cos(3)$
$\bar{V_5}$	$\bar{V_6}\frac{\partial V_6}{\partial V_5}$	$6\cos(3)$
$\bar{V_4}$	$\frac{\partial y_2}{\partial V_4}$	1
$\bar{V_3}$	$\bar{V_4}\frac{\partial V_4}{\partial V_3}$	1
$\bar{V_2}$	$\bar{V_4}\frac{\partial V_4}{\partial V_2}$	1
$\bar{V_1}$	$\bar{V_9}\frac{\partial V_9}{\partial V_1} + \bar{V_5}\frac{\partial V_5}{\partial V_1},\ \bar{V_2}\frac{\partial V_2}{\partial V_1} + \bar{V_3}\frac{\partial V_3}{\partial V_1} \rightarrow 2e^2 + 12\cos(3),\ V_0 + \sigma'(V_1)$	$2e^2 + 12\cos(3),\ 2 + \sigma'(1)$
$\bar{V_0}$	$\bar{V_8}\frac{\partial V_8}{\partial V_0},\ \bar{V_2}\frac{\partial V_2}{\partial V_0} = V_7, 2V_1$	$\sin(3),\ 1$

$$J = \begin{bmatrix} \sin(3) & 12\cos 3 + 2e^2 \\ 1 & 2 + \sigma'(1) \end{bmatrix}$$