

Table 1: NC Moment Matrix

1	x	x	x^2	xy	yx	y^2	x^3	x^2y	xyx	xy^2	yx^2	$yxxy$	yx^2	$yxxy$	y^2x	y^3
x	x^2	xy	x^3	x^2y	xyx	xy^2	x^4	x^3y	x^2yx	x^2y^2	xyx^2	$xyxy$	xyx^2	$xyxy$	xy^2x	xy^3
y	yx	y^2	yx^2	$yxxy$	y^2x	y^3	yx^3	yx^2y	$yxxy$	yx^2y^2	$yxxy^2$	yx^2yx	$yxxy^2$	$yxxy$	y^3x	y^4
x^2	x^3	x^2y	x^4	x^3y	x^2yx	x^2y^2	x^5	x^4y	x^3yx	x^3y^2	x^4yx	x^3yx^2	x^3yx^2	x^2yxy	x^2y^2x	x^2y^3
yx	xyx	$yxxy$	yx^3	yx^2y	$yxxy$	yx^2y^2	yx^4	yx^3y	yx^2yx	yx^2y^2	$yxxyx^2$	$yxxyx$	$yxxyx^2$	$yxxyx$	yx^2yx	$yxxy^3$
xy	xyx	xy^2	xyx^2	$xyxy$	xy^2x	xy^3	xyx^3	xyx^2y	$xyxyx$	$xyxy^2$	xyx^2yx	$xyxyx$	$xyxyx^2$	$xyxyx$	xy^3x	xy^4
y^2	y^2x	y^3	y^2x^2	y^2xy	y^3x	y^4	y^2x^3	y^2x^2y	y^2xyx	y^2xy^2	y^2yx^2	y^2xyx	y^2xyx^2	y^2xyx	y^3x	y^5
x^3	x^4	x^3y	x^5	x^4y	x^3yx	x^3y^2	x^6	x^5y	x^4yx	x^4y^2	x^5yx	x^4yx^2	x^4yx^2	x^3yxy	x^3y^2x	x^3y^3
yx^2	yx^3	yx^2y	yx^4	yx^3y	yx^2yx	yx^2y^2	yx^5	yx^4y	yx^3yx	yx^3y^2	yx^4yx	yx^3yx^2	yx^3yx^2	yx^2yxy	yx^2y^2x	yx^2y^3
xyx	xyx^2	$xyxy$	xyx^3	xyx^2y	$xyxyx$	$xyxy^2$	xyx^4	xyx^3y	xyx^2yx	xyx^2y^2	$xyxyx^2$	$xyxyx$	$xyxyx^2$	$xyxyx$	xy^2x	$xyxy^3$
y^2x	y^2x^2	y^2xy	y^2x^3	y^2x^2y	y^2xyx	y^2xy^2	y^2x^4	y^2x^3y	y^2x^2yx	$y^2x^2y^2$	y^2yx^2	y^2xyx	y^2xyx^2	y^2xyx	y^2xy^2x	y^2xy^3
x^2y	x^2yx	x^2y^2	x^2yx^2	x^2yxy	x^2y^2x	x^2y^3	x^2yx^3	x^2yx^2y	x^2yxyx	x^2yxy^2	x^2yxx^2	x^2yxyx	x^2yxyx^2	x^2y^2xy	x^2y^3x	x^2y^4
$yxxy$	$yxxyx$	$yxxy^2$	$yxxyx^2$	$yxxyxy$	$yxxy^2x$	$yxxy^3$	$yxxyx^3$	$yxxyx^2y$	$yxxyxyx$	$yxxyxy^2$	$yxxyx^2yx$	$yxxyxyx$	$yxxyx^2yx$	$yxxy^2xy$	$yxxy^3x$	$yxxy^4$
xy^2	xy^2x	xy^3	xy^2x^2	xy^2xy	xy^3x	xy^4	xy^2x^3	xy^2x^2y	xy^2xyx	xy^2xy^2	xy^2yx^2	xy^2xyx	xy^2xyx^2	xy^3xy	xy^4x	xy^5
y^3	y^3x	y^4	y^3x^2	y^3xy	y^4x	y^5	y^3x^3	y^3x^2y	y^3xyx	y^3xy^2	y^4x^2	y^4xyx	y^4x^2	y^4xy	y^5x	y^6

Table 2: NC Hankel Matrix

	1	x	y	x^2	xy	yx	y^2	x^3	x^2y	xyx	xy^2	yx^2	xyy	y^2x	y^3
1	1	X^a	Y	A	B	B^T	C	D	E	F	G	E^T	J	G^T	H
x	X	A	B	D	E	F	G	K	L	M	N	M^T	Q	O	R
y	Y	B^T	C	E^T	J	G^T	H	L^T	P	Q^T	S	N^T	S^T	R^T	T
x^2	A	D	E	K	L	M	N	U	V	Z	Δ	Γ	Θ	Ξ	Ω
yx	B^T	E^T	J	L^T	P	Q^T	S	V^T	W	Λ^T	\mathbb{A}	Θ^T	\mathbb{L}	\mathbb{A}^T	Φ
xy	B	F	G	M^T	Q	M	R	Z^T	Λ	Π	\mathbb{C}	Ξ^T	\mathbb{A}	I	Υ
y^2	C	G^T	H	N^T	S^T	R^T	T	Δ^T	\mathbb{A}^T	\mathbb{C}^T	Ψ	Ω^T	Φ^T	Υ^T	Σ
x^3	D	K	L	U	V	Z	Δ	W_{x^6}	W_{x^5y}	W_{x^4yx}	$W_{x^4y^2}$	$W_{x^3yx^2}$	W_{x^3yxy}	$W_{x^3y^2x}$	$W_{x^3y^3}$
yx^2	E^T	L^T	P	V^T	W	Λ^T	\mathbb{A}	W_{yx^5}	W_{yx^4y}	W_{yx^3yx}	$W_{yx^3y^2}$	$W_{yx^2yx^2}$	W_{yx^2yxy}	$W_{yx^2y^2x}$	$W_{yx^2y^3}$
xyx	F	M^T	Q	Z^T	Λ	Π	\mathbb{C}	W_{xyx^4}	W_{xyx^3y}	W_{xyx^2yx}	$W_{xyx^2y^2}$	W_{xyxyx^2}	W_{xyxyxy}	W_{xyxy^2x}	W_{xyxy^3}
y^2x	G^T	N^T	S^T	Δ^T	\mathbb{A}^T	\mathbb{C}^T	Ψ	$W_{y^2x^4}$	$W_{y^2x^3y}$	$W_{y^2x^2yx}$	$W_{y^2x^2y^2}$	$W_{y^2xyx^2}$	W_{y^2xyxy}	$W_{y^2xy^2x}$	$W_{y^2xy^3}$
x^2y	E	M	N	Γ	Θ	Ξ	Ω	$W_{x^2yx^3}$	$W_{x^2yx^2y}$	$W_{x^2yx^2y}$	$W_{x^2yx^2y^2}$	$W_{x^2y^2x^2}$	$W_{x^2y^2xy}$	$W_{x^2y^3x}$	$W_{x^2y^4}$
yx^2y	J	Q^T	S	Θ^T	\mathbb{L}	\mathbb{A}^T	Φ	$W_{yx^2yx^3}$	$W_{yx^2yx^2y}$	$W_{yx^2yx^2y}$	$W_{yx^2yx^2y^2}$	$W_{yx^2y^2x^2}$	$W_{yx^2y^2xy}$	$W_{yx^2y^3x}$	$W_{yx^2y^4}$
xy^2	G	O	R	Ξ^T	\mathbb{A}	I	Υ	$W_{xy^2x^3}$	$W_{xy^2x^2y}$	$W_{xy^2x^2y}$	$W_{xy^2xy^2}$	$W_{xy^3x^2}$	W_{xy^3xy}	W_{xy^4x}	W_{xy^5}
y^3	H	R^T	T	Ω^T	Φ^T	Υ^T	Σ	$W_{y^3x^3}$	$W_{y^3x^2y}$	W_{y^3xyx}	$W_{y^3xy^2}$	$W_{y^4x^2}$	W_{y^4xy}	W_{y^5x}	W_{y^6}

^aThese variables obey that $W_{word} = W_{word}^T$, and that $X, Y, A, C, D, F, H, J, K, O, P, T, U, \Gamma, \Pi, W, \Sigma, \Psi, I$, and L are all symmetric.