APPENDIX A

The first out-of-plane shape functions after the cubic polynomials are given by

$$f_5 = (1/8) - (1/4)\xi^2 + (1/8)\xi^4$$

$$f_6 = (1/8)\xi - (1/4)\xi^3 + (1/8)\xi^5$$

$$f_7 = -(1/48) + (3/16)\xi^2 - (5/16)\xi^4 + (7/48)\xi^6$$

$$f_8 = -(1/16)\xi + (5/16)\xi^3 - (7/16)\xi^5 + (3/16)\xi^7$$

$$f_9 = (3/384) - (15/96)\xi^2 + (35/64)\xi^4 - (63/96)\xi^6 + (99/384)\xi^8$$

$$f_{10} = (5/128)\xi - (35/96)\xi^3 + (63/64)\xi^5 - (33/32)\xi^7 + (143/384)\xi^9$$

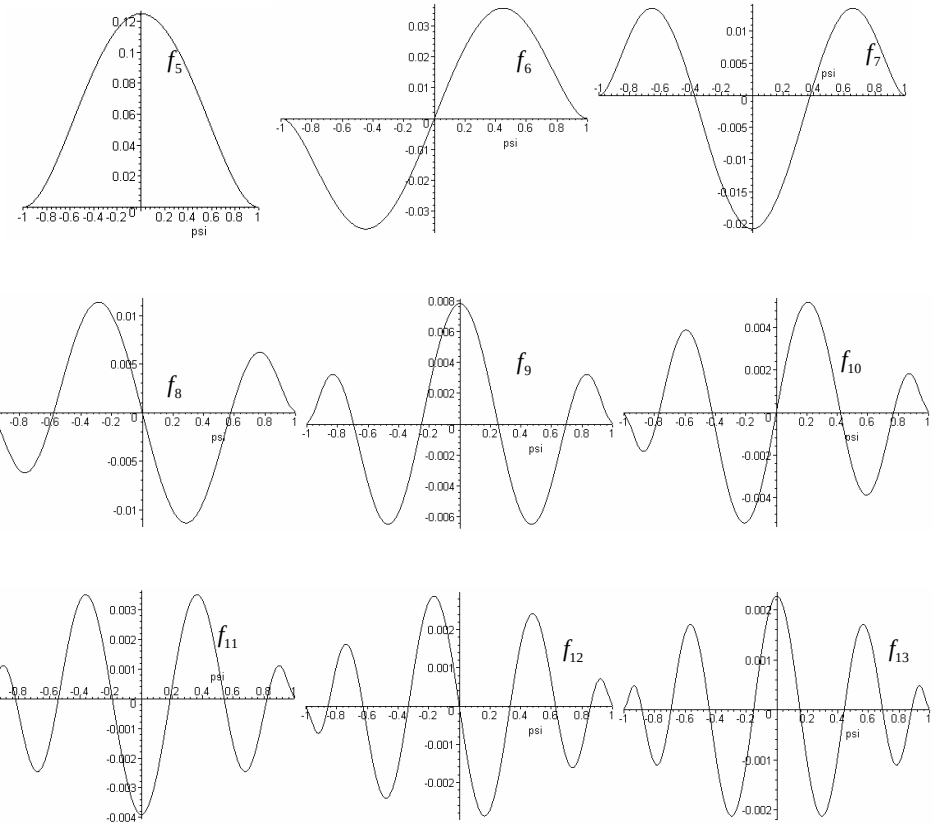
$$f_{11} = -(1/256) + (35/256)\xi^2 - (105/128)\xi^4 + (231/128)\xi^6 - (429/256)\xi^8 + (143/256)\xi^{10}$$

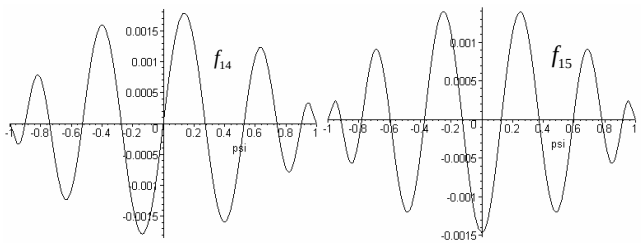
$$f_{12} = -(7/256)\xi + (105/256)\xi^3 - (231/128)\xi^5 + (429/128)\xi^7 - (715/256)\xi^9 + (221/256)\xi^{11}$$

$$f_{13} = (7/3072) - (63/512)\xi^2 + (1155/1024)\xi^4 - (1001/256)\xi^6 + (6435/1024)\xi^8 - (2431/512)\xi^{10} + (4199/3072)\xi^{12}$$

$$f_{14} = (21/1024)\xi - (231/512)\xi^3 + (3003/1024)\xi^5 - (2145/256)\xi^7 + (12155/1024)\xi^9 - (4199/512)\xi^{11} + (2261/1024)\xi^{13}$$

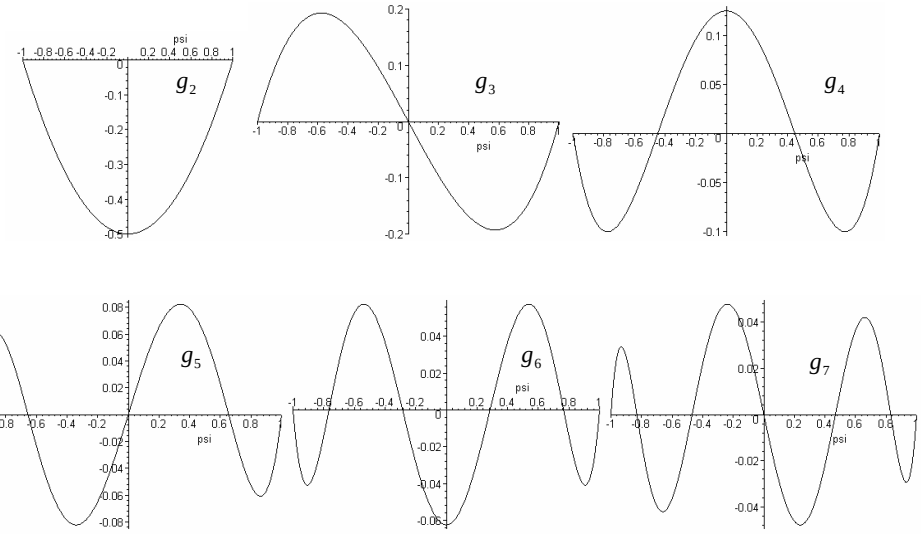
$$f_{15} = -(3/2048) + (231/2048)\xi^2 - (3003/2048)\xi^4 + (15015/2048)\xi^6 - (36465/2048)\xi^8 + (46189/2048)\xi^{10} - (29393/2048)\xi^{12} + (7429/2048)\xi^{14}$$

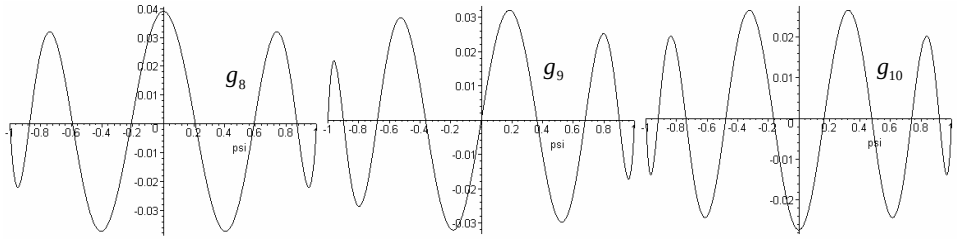


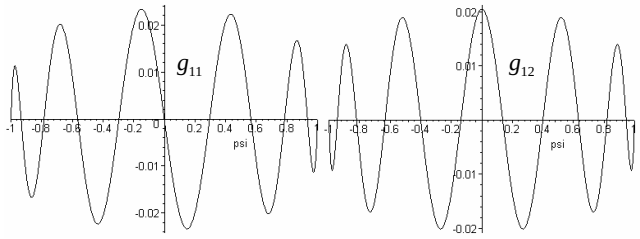


In-plane shape functions

$$g_2 = -(1/2) + (1/2)\xi^2$$
$$g_3 = -(1/2)\xi + (1/2)\xi^3$$
$$g_4 = (1/8) - (3/4)\xi^2 + (5/8)\xi^4$$
$$g_5 = (3/8)\xi - (5/4)\xi^3 + (7/8)\xi^5$$
$$g_6 = -(1/16) + (15/16)\xi^2 - (35/16)\xi^4 + (63/48)\xi^6$$
$$g_7 = -(5/16)\xi + (35/16)\xi^3 - (63/16)\xi^5 + (99/48)\xi^7$$
$$g_8 = (5/128) - (105/96)\xi^2 + (315/64)\xi^4 - (693/96)\xi^6 + (1287/384)\xi^8$$
$$g_9 = (35/128)\xi - (105/32)\xi^3 + (693/64)\xi^5 - (429/32)\xi^7 + (715/128)\xi^9$$
$$g_{10} = -(7/256) + (315/256)\xi^2 - (1155/128)\xi^4 + (3003/128)\xi^6 - (6435/256)\xi^8 + (2431/256)\xi^{10}$$
$$g_{11} = -(63/256)\xi + (1155/256)\xi^3 - (3003/128)\xi^5 + (6435/128)\xi^7 - (12155/256)\xi^9 + (4199/256)\xi^{11}$$
$$g_{12} = (21/1024) - (693/512)\xi^2 + (15015/1024)\xi^4 - (15015/256)\xi^6 + (109395/1024)\xi^8 - (46189/512)\xi^{10} + (29393/1024)\xi^{12}$$




g_8
g_9
g_{10}
psi


g_{11}
g_{12}
psi