PH16212, Homework 3

Deadline: Oct. 28, 2019

1. Complete the detailed computation steps of the BCFW computation of the six-point Yang-Mills NHMV amplitude,

$$A(1^-2^-3^-4^+5^+6^+) = \frac{-i(\langle 1,5\rangle[4,5] + \langle 1,6\rangle[4,6])^3}{\langle 1,6\rangle\langle 5,6\rangle \ [2,3][3,4](\langle 1,5\rangle[1,2] + \langle 5,6\rangle[2,6])(s_{15} + s_{16} + s_{56})}$$
$$+ \frac{-i(\langle 1,3\rangle[1,6] + \langle 2,3\rangle[2,6])^3}{\langle 3,4\rangle\langle 4,5\rangle[1,2] \ [1,6](\langle 1,5\rangle \ [1,2] + \langle 5,6\rangle[2,6])(s_{12} + s_{16} + s_{26})} \tag{1}$$

with the shift

$$p_1(z) = 1(\tilde{1} - z\tilde{6}) \tag{2}$$

$$p_6(z) = (6 + z1)\tilde{6} \,. \tag{3}$$

2. Use Schouten identities and the MHV formalism to explicitly prove the seven-point BCJ identity:

$$s_{12}A(2^-1^-3^+4^+5^+6^+7^+) = s_{23}A(1^-3^+2^-4^+5^+6^+7^+) + (s_{23} + s_{24})A(1^-3^+4^+2^-5^+6^+7^+)$$

$$(s_{23} + s_{24} + s_{25})A(1^-3^+4^+5^+2^-6^+7^+) + (s_{23} + s_{24} + s_{25} + s_{26})A(1^-3^+4^+5^+6^+2^-7^+) \,.$$