

1112-11-69

**Bronz D McDaniels\*** (mcdanie3@purdue.edu), 1196 Third Street, West Lafayette, IN 47906, and **Danny Sweeney** and **Sofia Lyrintzis** (soros01@students.ipfw.edu), 124 Westwood Drive, West Lafayette, IN 47906, and **Yesid Sanchez** (yasancheza@unal.edu.co), Arnold Drive, 150-12, West Lafayette, IN 47906. *Examples of Belyĭ Maps for Elliptic Curves*. Preliminary report.

A Belyĭ map  $\beta : \mathbb{P}^1(\mathbb{C}) \rightarrow \mathbb{P}^1(\mathbb{C})$  is a rational function with at most three critical values; we may assume these values are  $\{0, 1, \infty\}$ . Replacing  $\mathbb{P}^1$  with an elliptic curve  $E : y^2 = x^3 + Ax + B$ , there is a similar definition of a Belyĭ map  $\beta : E(\mathbb{C}) \rightarrow \mathbb{P}^1(\mathbb{C})$ .

This project seeks to determine examples of Belyĭ maps for elliptic curves. We have shown that given any elliptic curve  $E$  there exist infinitely many Belyĭ maps of degree 2; they are in the form  $\beta(x, y) = (ax + b)/(cx + d)$ . We have also shown that any elliptic curve has at least one Belyĭ map of degree 3 with critical values  $\{0, 1, \infty\}$ . After placing the curve in Hessian normal form  $y^2 + a_1 xy + a_3 y = x^3$ , the Belyĭ map is in the form

$$\beta(x, y) = \frac{(2a_1^3 - 27a_3 + 2\sqrt{a_1^6 - 27a_1^3a_3})y - 27a_3^2}{(2a_1^3 - 27a_3 - 2\sqrt{a_1^6 - 27a_1^3a_3})y - 27a_3^2} \quad \text{for } a_1 \neq 0.$$

This work is part of PRiME (Purdue Research in Mathematics Experience). (Received July 15, 2015)