History of Mathematical Ideas
Quiz 9

Name:_____

You have 10 minutes to complete this quiz. If you have a question raise your hand and remain seated. In order to receive full credit your answer must be **complete**, **legible** and **correct**. Show your work, and give adequate explanations.

1. Write down the homogeneous form of $x + 2y = 3$.

This polynomial equation is $F(x, y) = 0$ for $F(x, y) = x + 2y - 3$, which has degree 1. The homogenization of F is $z \cdot F(x/z, y/z) = x + 2y - 3z$. The answer to the problem is therefore $x + 2y - 3z = 0$ or $x + 2y = 3z$.

2. Write down coordinates for the point at infinity on the curve from Problem 1.

To find the point at infinity, we set $z = 0$ and find that $x+2y = 0$, or $x = -2y$. Since the coordinates of any point in $\mathbb{RP}^2$ are determined only up to scalar multiplication, we can scale so that $y = 1$ and then use the equation $x = -2y$ to calculate that $x = -2$. Altogether, the point at infinity on $x+2y = 3$ is $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -2 \\ 1 \\ 0 \end{bmatrix}$. Any nonzero scalar multiple of this column vector is also a correct answer to this question.