Math 251 **Name(s):**

PaperAssign 2

Workshop (in-class)

September 8, 2017

(1) Show that every straight line has curvature 0 everywhere.

(2) An ant walks along a piece of wire in the shape of the curve $\mathbf{r}(t) = \langle 3\sin t, 4t, 3\cos t\rangle$ (all distances measured in inches), starting at the point $(0, 0, 3)$. Where in space is the ant after walking 5 inches?

(3) The definition of curvature makes sense even for curves in $\mathbb{R}^2$. Back in our calc 1 mindsets, let $y = f(x)$; the curvature of the graph of f "should be" related to f''. Treating the graph as though it is in $\mathbb{R}^3$: $\mathbf{r}(t) = \langle t, f(t), 0\rangle$, find a formula for the curvature in terms of f, f', f''. Then apply this formula to the graph of $y = x^3$, and verify that it makes sense (at a few points and as $x \to \pm\infty$).

(4) Below is a curve lying in the xy-plane, oriented in the positive x-direction. Draw, at the specified points, the vectors $\widehat{\mathbf{T}}$ and $\widehat{\mathbf{N}}$. What direction is $\widehat{\mathbf{B}}$ at each point? What point(s) appear(s) to have the greatest or least curvature?