

## Quiz #3 for Calculus 3 (MATH-UA.0123-001)

**Problem 1.** Let  $\mathbf{r}(t)$  be a curve, and assume that  $|\mathbf{r}(t)| = c$  for all  $t \in \mathbb{R}$ , where  $c > 0$  is a constant. Show that  $\mathbf{r}(t)$  and  $\mathbf{r}'(t)$  are orthogonal for all  $t$  such that  $\mathbf{r}'(t)$  exists. [2 points]

**Problem 2.** Compute the arc length function  $s(t)$  for the helix  $\mathbf{r}(t) = (\cos(t), \sin(t), t)$  starting from  $t = 0$ . [2 points]

**Problem 3.** Compute the curvature of the helix (that is,  $\mathbf{r}(t)$  from Problem 3) using any formula you like. [3 points]

**Problem 4.** Compute the unit normal and binormal vectors of the helix. [3 points]