Quiz 2 — MA261 — June 20, 2017

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1. (6 points) Find the length of the curve $\mathbf{r}(t) = \mathbf{i} + t^2\mathbf{j} + t^3\mathbf{k}$, $0 \leq t \leq 1$.

2. (6 points) At what points does the helix $\mathbf{r}(t) = \langle \sin t, \cos t, t \rangle$ intersect the sphere $x^2 + y^2 + z^2 = 5$? Give the coordinates, not just the t-values.

3. (8 points) Let $\mathbf{r}(t) = te^t\mathbf{i} - 2\mathbf{j} + \sin(t)\mathbf{k}$.

   (a) Find $\mathbf{r}'(t)$.

   (b) Find a vector equation for the line $\mathbf{u}(t)$ tangent to the curve at the point where $t = 0$.