MTH 265, Quiz #3, Summer 2021 Name _____

Instructions: Show all work. Use exact answers unless specifically asked to round. Be sure to complete all parts of each question.

1. Rewrite the equation $x^2 + y^2 + z^2 - 9z = 0$ in cylindrical and spherical coordinates.

2. Determine if the $\lim_{(x,y)\to(0,0)} \frac{xy^2}{x^2+y^4}$ exists or is undefined. If it does exist, say what it is.

3. Sketch the curve $\vec{r}(t) = 2\cos t\,\hat{\imath} + 2\sin t\,\hat{\jmath} + t\hat{k}$ on the interval $0 \le t \le 4\pi$.

4. For the vector-values functions $\vec{r}(t) = 2\cos t\,\hat{\imath} + 2\sin t\,\hat{\jmath} + t\hat{k}$ and $\vec{u}(t) = t^3\hat{\imath} + e^t\hat{\jmath} - \frac{1}{t}\hat{k}$, perform the indicated operations.
   a. $\vec{r}\,'(t)$

   b. $\int \vec{u}(t)\,dt$

   c. $\vec{r}(t) \cdot \vec{u}(t)$

   d. $\|\vec{r}(t)\|$