

DIRECTIONS To receive full credit, you must provide complete legible solutions to the following problems in the space provided. No Attached papers. Transfer all your answers to the space provided.

1. Find the length of the curve.

Ans _____

$$\mathbf{r}(t) = \langle 3t, 3 \cos t, 3 \sin t \rangle, \quad -4 \leq t \leq 4$$

2. Let C be the curve of intersection of the parabolic cylinder $x^2 = 2y$ and the surface $3z = xy$. Find the exact length of C from the origin to the point $(4, 8, 32/3)$

Ans _____

3. Reparametrize the curve with respect to arc length measured from the point where $t = 0$ in the direction of increasing t .

$$\mathbf{r}(t) = 2t\mathbf{i} + (7 - 3t)\mathbf{j} + (2 + 4t)\mathbf{k}$$

Ans _____

4. Consider the following vector function.

$$\mathbf{r}(t) = \langle 3 \cos(t), 3 \sin(t), 3 \ln(\cos(t)) \rangle, \quad (3, 0, 0)$$

a. Find the unit tangent and unit normal vectors \mathbf{T} and \mathbf{N} , and \mathbf{B}

Ans _____

Ans _____

Ans _____

b. Find the curvature.

Ans _____

5. Find the equations of the osculating circles of the ellipse $9x^2 + 4y^2 = 36$ at the points $(2, 0)$