MATH 202, Fall 2024 **Name:** _____
Exam 4 Practice **Row and Seat**: _____

"If people sat outside and looked at the stars each night, I'll bet they'd live a lot differently."
CALVIN (BILL WATERSON)

1. For the parametricaly defined curve $\begin{cases} x = 3t \\ y = 9t^2 + t \end{cases}$ $-\infty < t < \infty$, eliminate the parameter t. Sketch the resulting curve in the xy cartesian coordinate system.

2. For the parametricaly defined curve $\begin{cases} x = 3\cos(t) \\ y = 9\sin(t) \end{cases}$ $0 \leq t \leq 2\pi$, eliminate the parameter t. Sketch the resulting curve in the xy cartesian coordinate system.

3. For the curve $x^3 + y^3 - 3xy = 48$, find the numerical value of $\left.\dfrac{\mathrm{d}y}{\mathrm{d}x}\right|_{x=2,y=4}$

4. For the parametrically defined curve $\begin{cases} x = -\sqrt{1+t} \\ y = \sqrt{3t} \end{cases}$ $0 \le t < \infty$, find the numerical values of $\left.\frac{\mathrm{d}y}{\mathrm{d}x}\right|_{t=3}$ and $\left.\frac{\mathrm{d}^2y}{\mathrm{d}x^2}\right|_{t=3}$.

5. Represent the arc length of the polar curve $r = a(1 - \sin(\theta))$ as a definite integral. Here a is a positive real number.

6. Find all points on the polar curve $r = 3 - 2\sin(\theta)$ that have a horizontal tangent line.

7. Find area of the region bounded by the polar curve $r = 3 - 2\sin(\theta)$

8. Find the area bounded by the polar curve $r = \cos(4\theta)$