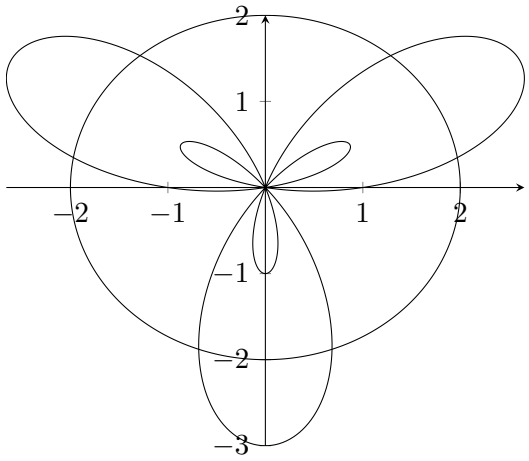
MATH 2300-015 QUIZ 13 Name: _____

Due Wednesday, December 13th at the beginning of class.

1. The polar curves

$$r(\theta) = 1 + 2\sin(3\theta),\ r = 2,$$

are graphed below.



(a) Find the area inside the larger loops and outside the smaller loops of the graph of $r = 1 + 2\sin(3\theta)$.

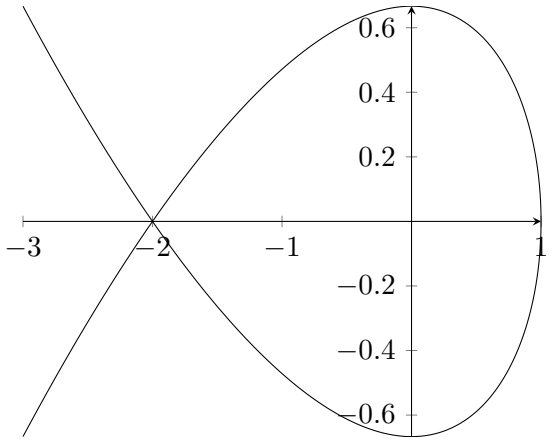
(b) Find the area outside the circle $r = 2$ but inside the curve $r = 1 + 2\sin(3\theta)$.

(c) What is the tangent line to the curve $r = 1 + 2\sin(3\theta)$ at the point in the first quadrant where r is maximum?

(d) Write down a definite integral for the arclength of the curve $r(\theta) = 1 + 2\sin(3\theta)$ and use a computer to evaluate.

2. Consider the parametric curve defined by

$$x(t) = 1 - t^2,\ y(t) = t - t^3/3.$$



(a) Find the equations of the tangent lines to the curve at the point $(-2, 0)$.

(b) When/where does the curve have horizontal tangents?

(c) What is the length of the part of the curve forming the "loop"?