

NAME: _____

Panther ID: _____

Worksheet/homework – Due Tuesday, Nov. 12

- MAC 2312, Fall 2019

1. An ant is travelling in the xy -plane along the parametric curve $(x(t) = e^{-t} \cos t, y(t) = e^{-t} \sin t)$, for $0 \leq t < +\infty$ (you can assume the parameter t to be time).

- (a) Sketch the curve the ant is following.
- (b) Find the coordinates of the points where the ant crosses the x -axis.
- (c) Find the total distance the ant is travelling, assuming the ant goes on forever.

2. You are the treasurer of the new island kingdom Polar Koordinatea where no calculators are allowed. The Queen summons you and gives you 24h to design a coin for the kingdom. After a sleepless night, you come up with two proposals:

- (i) The coin is the circle $r = 1$, having inside the rose $r = \cos(3\theta)$ whose petals are plated in gold;
- (ii) The coin is circle $r = 1$, having inside the rose $r = \sin(5\theta)$ whose petals are plated in gold.

(a) Draw the two designs you submit to the Queen.

(b) Seeing the designs, the Queen decides: “Make the one that has more gold. Bring it tomorrow!” What do you tell the Queen the next day?

(c) Next day, after your answer, the Queen decides again: “You modify the design (i) as follows. Inside the coin $r = 1$, draw also the circle $r = 1/2$. The part of the rose $r = \cos(3\theta)$ which is inside $r = 1/2$ shall be covered with platinum, the rest of the rose shall be covered with gold. And this shall be the coin of Polar Koordinatea!”

Just when you are about to leave happy, the Queen says: “I would like to know by tomorrow if more platinum or more gold is needed for the new coin. Tell me please the exact difference between the two areas.” Can you answer this?