## 1. Tangents, Arclengths an Polar Coordinates

The spiral is graphed out by the parametric equation

$$
x(t)=t \cos t \quad y(t)=t \sin t
$$

where $t \geq 0$
(1) What is equation for the line which touches the point on the curve $(0, \pi / 2)$ ?
(2) Write down an integral which computes the length of a spiral from $t=0$ to $t=2 \pi$.
(3) The Limacon is graphed by the polar equation

$$
r=1+c \sin \theta
$$

- What shape is this graph when $c=0$ ?
- Sketch a graph of this when $c=1$.
- What is the graph of $r=\cos (\theta)$ look like?
- Describe how the Limacon changes as $c$ goes to infinity.

