Group Member Names:

In [1]:
```
from sympy import *
from sympy.plotting import plot, plot_parametric
```

Lab 5 Template

Each part of each problem should be solved in its own cell.

Question 1

Let $x(t) = t\cos(t)$ and $y(t) = t\sin(t)$.

a.) Plot the curve in three **separate** plots using $t = [-\pi/4, \pi/4]$, $t = [-\pi, \pi]$, and $t = [-3\pi/2, 3\pi/2]$ using **ylim=[-5, 2]** and **xlim=[-5, 5]**.

b.) Find the approximate points on the graph (using **nsolve** and giving (x, y) pairs **not** t values) such that the tangent line is horizontal. (Hint: you need to give **nsolve** a guess to work properly. For this part, you'll need to use **nsolve** with 3 different guesses that yield three separate t values. It may take a few tries to get it right)

c.) Find the approximate points on the graph (using **nsolve**) such that the tangent line is vertical.

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Question 2

Let $x(t) = 2\cos(t) + \cos(2t)$ and $y(t) = 2\sin(t) - \sin(2t)$.

a.) Plot the curve for $t = [0, 6]$.

b.) Find the equation for the tangent line at $(-1, 2)$. (You may need to use **nsolve** for this part and use the plot to pick a good guess)

c.) Find all points where the curve has a vertical tangent line for t in the interval [0, 6]. (Hint: Be careful which t values you use when finding the point and make sure to verify that your t value makes sense. Many t values may look like possible answers, but they are not.)

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Question 3

Find $\frac{dy}{dx}$ for the following functions and be sure to use **.simplify()** on your final answer.

a.) $y = x^{\sin(x^2)}$

b.) $y = \arctan(\arccos(e^x))$

c.) $y^2 + \sin(y) = \frac{x^2-1}{x^3+7}$ (Hint: If you have $f(y) = g(x)$, then $\frac{dy}{dx} = \frac{g'(x)}{f'(y)}$. Also for this problem, use **.factor()** instead of **.simplify()**)

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