Group Member Names:

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

Lab 2 Template

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

Question 1

For this problem, we will investigate the properties of the function $f(x) = ax^3 + bx^2 + cx + d$ where a, b, c, d are constants.

a.) Let $b = 1, c = 1, d = 1$. For $a = .5, 2.5, 10$, plot $f(x)$ for each value of a, putting all plots on the same axes [-5, 5]. In a print statement, explain what happens to the graph of $f(x)$ when a gets larger. (Note: To make the different graphs more clear, use line_color='r'/'g'/'b' in **plot** to set the color of the each graph to red/blue/green respectively)

b.) Let $a = 1, b = 1, c = 1$. For $d = -50, 0, 50$, plot $f(x)$ for each value of d, putting all plots on the same axes [-5, 5]. In a print statement, explain what happens to the graph of $f(x)$ when d changes.

c.) Let $a = 1, b = -1, c = -10$. For $d = -20, 0, 20$, plot $f(x)$ for each value of d, putting all plots on the same axes [-5, 5], then use the **solve** command to find the zeros of the function with the most zeros.

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Question 2

The formula for the height of a falling ball is given by $s(t) = \frac{g}{2}t^2 + v_0 t + s_0$ where $g = -32$ ft/sec ^{2} is acceleration due to gravity, v_0 is the initial velocity of the ball in ft/sec, and s_0 is the initial height of the ball given in feet.

a.) Given $v_0 = 30$ and $s_0 = 50$, plot $s(t)$ on [0, 5].

b.) For the $s(t)$ given in part a, at what time does the ball hit the ground?

c.) Given an initial height of 10 ft, what initial velocity is required to guarantee the ball hits the ground at $t = 10$ seconds?

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Question 3

The formula for a circle is given by $(x-h)^2+(y-k)^2=r^2$ where (h,k) is the center of the circle and r is the radius. Plot the circle with a radius of 3 and a center at $(-1,1)$. Remember that the sympy "plot" function only works with functions in terms of x, so it will take two plots on the same axes of [-10, 10] to make a circle. (Note: sympy will struggle to plot the left and right side of the circle due to some numerical issues, but this is not a concern)

In [ ]: