Separation of Variables [1]

- Enter the following sequence of commands:

```
syms t
f = sqrt(9-t^2)
int(f) ............................ An antiderivative of f.
int(f, -3, 3) ..................... The definite integral.
g = t*acos(t) ..................... acos(t) is arccos t
diff(g)
pretty(ans)
diff(g, 2) ........................ The second derivative of g.
pretty(ans)
diff(g, 3) ........................ The third derivative of g.
pretty(ans)
ezplot(f, [-3, 3])
ezplot(g, [-1, 1])
```

- **Remarks.** The graph of `f` should be the upper half of a circle. It will be distorted because of the default scale on the y-axis. Display the graph again and in the `Figure window`, click on [Edit]. Pull down to `Axes Properties`. Reset the y-limits to be `-1.5` and `3.1`, click on [Apply] and then [OK]. The graph should now appear more like a semicircle.

  Type `help sym/diff` or `help int` in MATLAB for more info on the use of `diff` or `int`.

Following the methodology above, using a separate piece of paper, do the following.

1. Find the particular solution to the ODE $y'' = \sec y'$ that is tangent to the `t`-axis at the origin ($y'(0) = 0, y(0) = 0$). Use the method of separation of variables, and make sure to include all of the steps. Use MATLAB to compute the appropriate integrals.

   (Hint. Let $u = y'$ and remember to add a constant of integration where appropriate.)

2. Find the area under the graph of the solution of the IVP in part (a) on the interval $[-1, 1]$. Make sure to write the formula you use, not just the answer. Again, use MATLAB to compute the appropriate integrals.

3. Use MATLAB to plot the solution of the IVP in part (a) on the interval $[-1, 1]$. Sketch the graph, *by hand*. DO NOT HAND IN A PRINTOUT!

4. Find the absolute maximum value of the solution on the interval $[-1, 1]$.