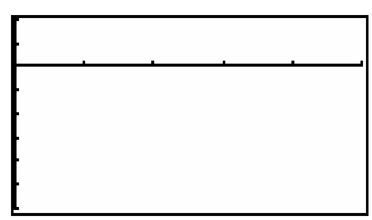
Assignment 17: Separable Differential Equations (7.2) Name___________________
Please provide a handwritten response.

1a. The separable differential equation $y' = \dfrac{x^2 + \sqrt{x}}{e^{2y} + y - \sin y}$ is written as $\int \left(e^{2y} + y - \sin y\right) dy = \int \left(x^2 + \sqrt{x}\right) dx$ with the variables separated. Integrate by hand to obtain an equation of the form $G(y) = H(x) + C$ and record the result below.

1b. You can form an IVP (Initial Value Problem) by adding the initial condition $y(1.5) = 1$ to the differential equation in **1a.** Use the **SOLVER** (see assignment 3) on your calculator to solve for the constant ***C***. Enter your result from **1a.** and enter $x = 1.5,\ y = 1$. Place the cursor on ***C*** and solve. Record the result below.

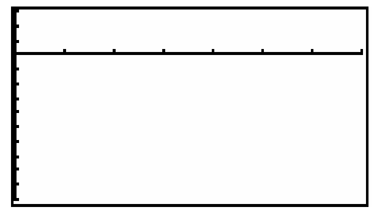
Now rewrite the general solution substituting the above value for ***C*** and record the solution below.

1c. It would be impossible to solve this particular solution for y. To graph this solution you can resort to the **IMPGRAPH** program used in Assignment 9. Remember to put the IVP in **Y1** as $Y_1 = \left(e \wedge (2y)\right)/2 + y^2/2 + \cos(y) - (x \wedge 3)/3 - \left(2x \wedge (3/2)\right)/3 - 2.385$ (don't forget to deselect Y1) and to set the **WINDOW** to $0 \le x \le 5, -6 \le y \le 2$ before starting. Record your results on the graph below. (Remember, this program graphs **VERY SLOWLY**!)



$0 \le x \le 5, -6 \le y \le 2$

1d. If there were no initial condition attached to the differential equation, then you could create a family of particular solutions by letting ***C*** range, say, from **–2** to **2.** All these solutions could then be graphed on the same axes showing how the solutions vary with ***C.*** Enter $\boldsymbol{Y1 = e \wedge (2Y)/2 + Y^2/2 + \cos Y - x \wedge 3/3 - (2x \wedge (3/2)/3) + C}$. Run this program with $\boldsymbol{C = -2, 0, 2}$. Do not clear your graph between different runs of the program and the results will appear together on your calculator. (Again, remember this program graphs exceedingly slowly!!!!) Record your result below.



$\boldsymbol{0 \le x \le 7, -10 \le y \le 3}$