**Assignment 18: 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

$\int \left(e^\wedge(2y) + y - \sin(y), y \right)$ and store the result as $g(y)$. Integrate $\int \left(x^\wedge 2 + \sqrt{x}, x \right)$ and store

the result as $h(x)$. Now form $g(y) = h(x) + c$ and record your 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.** Evaluate $g(y) = h(x) + c$ at $y(1.5) = 1$ by entering

$g(y) = h(x) + c \,/\, x = 1.5$ **and** $y = 1$ and record the result below. Use the **solve** command to

solve the resulting equation for c and record the result below.

Rewrite the general solution substituting the above value for c (add $/c =$ ___ to the above

result) and record the solution below.

1c. It would be impossible to solve this particular solution for y. To graph this solution you can

graph it as you graphed the implicit function in **Assignment 9**. Put the IVP in ♦**Y** as

$z1(x, y) = \left(e^\wedge(2y) \right)/2 + y^\wedge 2/2 + \cos(y) - \left(x^\wedge 3 \right)/3 - \left(2x^\wedge(3/2) \right)/3 - 2.385$ (on the

Voyage 200 enter this expression as **y1** and deselect **y1**). Set the **WINDOW** to

$0 \le x \le 5, -6 \le y \le 2$ before starting. Record your results on the graph below.
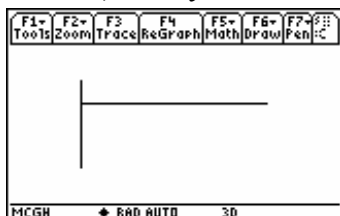
$0 \le x \le 5, -6 \le y \le 2$

$eye\theta = -90, \ eye\phi = 0, \ eye\Psi = 0$

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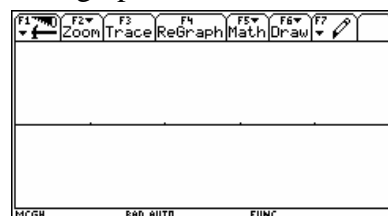
$0 \le x \le 5, -6 \le y \le 2$

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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. **T**hese solutions could then be graphed on the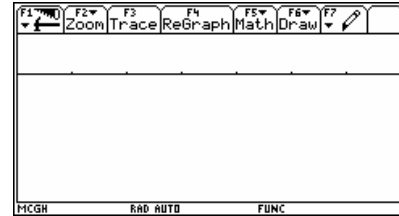 same axes showing how the solutions vary with c. Plot $z1 = e\wedge(2y)/2 + y\wedge2/2 + \cos y - x\wedge3/3 - (2x\wedge(3/2)/3) + c$ with $c = -2, 0, 2$ (on the Voyage 200 enter the expression in $y1$, deselect $y1$ and run the **impgraph** program). First use $c = -2$ and save the picture as **dif1** for comparison. Regraph the expression with $c = 0$ and compare with the picture. Sketch the graphs obtained when $c = -2, 0, 2$ on the same set of axes below.
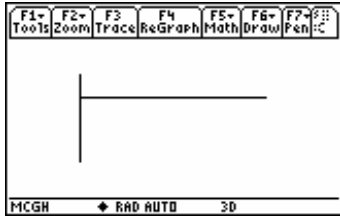
$$0 \le x \le 7, -10 \le y \le 3$$

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$$0 \le x \le 7, -10 \le y \le 3$$

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