Name: _____

September 23rd, 2015.
Math 2552; Sections **L1** – **L4**.
Georgia Institute of Technology
Exam 1

I commit to uphold the ideals of honor and integrity by refusing to betray the trust bestowed upon me as a member of the Georgia Tech community. By signing my name below I pledge that I have neither given nor received help on this exam.

Pledged: _____

Problem	Possible Score	Earned Score
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

Remember that you must SHOW YOUR WORK to receive credit!

Good luck!

1. Consider the autonomous equation:

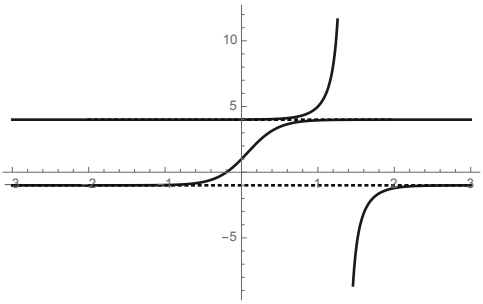
$$\frac{dy}{dx} = (y+1)^2(4-y).$$

(a). Find the equilibrium solutions:

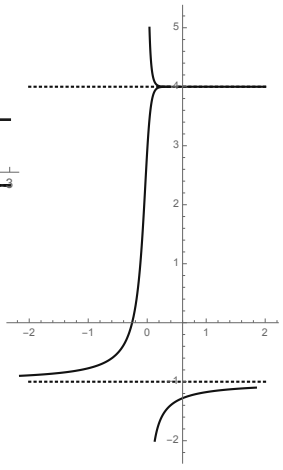
(b). Draw the phase portrait.

(c). Determine which of the graphs below could be possible solutions to this equation (circle the correct one).

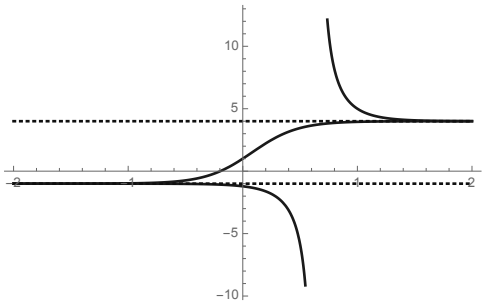
A.



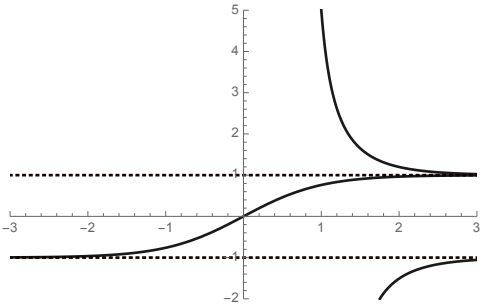
B.



C.



D.



2. Consider the differential equation:

$$y' + y \sin x = \sin x.$$

(a). If $y(x)$ is a solution to this equation and $y(\pi/2) = 2$, find $y(0)$.

(b). If $y(x)$ is a solution to this equation and $y(\pi/2) = 1$, find $y(\pi^e)$.

3. Find an explicit solution to the differential equation:

$$\frac{dx}{dy} = \frac{e^x}{2\sqrt{y}(e^{2x} - x)}.$$

4. Find the value of k for which the following differential equation is exact:

$$\left(ye^{xy} + y^2 - \frac{y}{x^2}\right)\,dx + \left(xe^{xy} + kxy + \frac{1}{x} + 2y\right)\,dy = 0,$$

and solve the equation for this value of k (give an *implicit* answer).

5. Solve the differential equation:

$$y' + 4xy = 4x\sqrt{y},$$

and give an *explicit* solution.