238 Chapter 3 Quiz

Ma	rch 1	1, 2013		Name:		
					By printing my name I pledge to uphol	d the honor code.
1.	. Fill in the blank.					
	a)	Our only tool for sol	ving general firs	t order ordin	ary differential equations is	
	b)	The most useful way	v to break the set	t of solutions	to a differential equation into	o regions is
		to find the				
	c)	The three special ty	pes of first order	ODEs we ha	we techniques to solve are	
				,		, and
	d)	Using the multi-vari	able chain rule $\frac{d}{d}$	$\frac{d}{dx}F(x,y) = _$		

2. Using the grid below, sketch phase portrait for the differential equation y' = y + 1.

+ + + - + - + + - + + - + + + + - + - +	- + + + - + + + - + + +
+ + + - + + + -	- + + + - + + + - + + +

a) Use your solutions to sketch solutions to the equation passing through the following points (0,0), (-1,1), (2,-1) and (0,-2).

++++	- + + +
++++	- + + +
++++	• + + +
+ + + +	+++
+ + + +	• + + +
+ + + +	• + + +

3. Describe the phase portrait for the following differential equation and give a rough sketch of the solutions on the axis below. Be sure to specify any equilibrium solutions, and make it clear where your solutions are increasing, decreasing concave up or concave down. Show your work in the space to the left.

y' =

$$y^2 - xy$$

4. Give the general solution to the following differential equations explicitly as a function of y.

$$y' = y \sin x$$

5. Solve the following initial value problem. Please show all your work using a method that I can read!

$$2xy\,dx + (x^2 + 2y)dy = 0, y(1) = 1$$

6. Solve the following initial value problem.

$$y' - 2y = 3e^{3x}, y(0) = -4$$

7. True/False, circle T or F as appropriate.

a)	Т	F	If solutions for initial value problems are unique, then any solution to a differential equation divides the domain into two separate regions.
b)	т	\mathbf{F}	Phase portraits are used to produce exact solutions differential equations.
c)	Т	\mathbf{F}	All separable differential equations are solvable in terms of equations with- out integral signs.
d)	Т	\mathbf{F}	Our technique for solving exact differential equations is based on the prod- uct rule.
e)	Т	F	Our technique for solving first order linear differential equations is based on the multivariable chain rule.
f)	\mathbf{T}	\mathbf{F}	$\frac{dy}{dx} = \sqrt{1 + x^4} e^{-y^2}$ is a separable differential equation.
g)	Т	\mathbf{F}	Our technique for solving first order linear ODEs works (at least in theory) on <i>any</i> first order linear ODE.