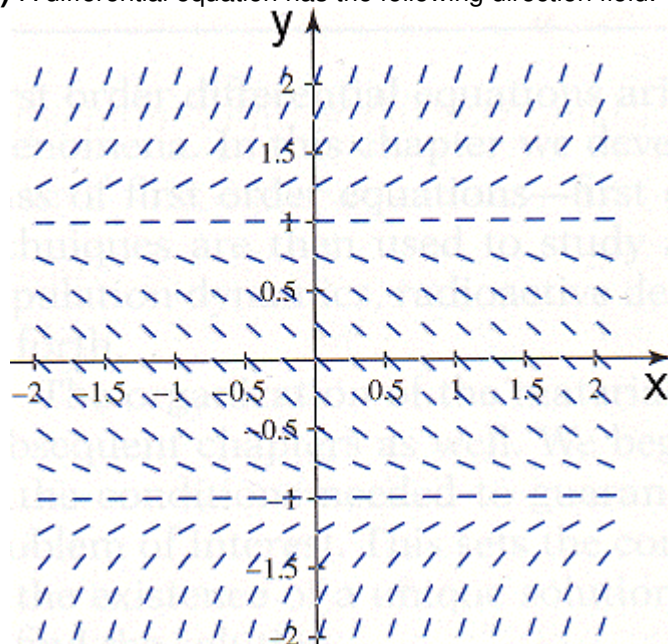


Prob. Num.	Point Value	Points Given
1a	4	
1b	4	
1c	4	
1d	6	
2	16	
3	16	
4	16	
5	16	
6a	6	
6b	6	
6c	6	
Total	100	
Adj.		
Grade		

1) A differential equation has the following direction field:



- Sketch the solution curve with initial condition  $y(-2) = -2$ .
- Sketch the solution curve with initial condition  $y(0) = 0$ .
- Sketch the solution curve with initial condition  $y(1) = 1$ .
- What can be said about the behavior of the above solutions as  $x \rightarrow \infty$  and  $x \rightarrow -\infty$ ?

2) Solve the initial value problem:  $\frac{dy}{dx} = y \sin x$ ,  $y(\pi) = -3$

3) Obtain the general solution to  $x \frac{dy}{dx} + 2y = 5x^3$ . Waste no time beautifying the solution!

4) If the equation exact? If so, then solve it:  $(\cos x \cos y + 2x)dx - (\sin x \sin y + 2y)dy = 0$

5) Find an integrating factor of the form  $x^m y^n$  and solve the equation:  
 $(12 + 5xy)dx + (6xy^{-1} + 3x^2)dy = 0$

6) Classify each as an ordinary or partial differential equation, give the order, and identify the independent and dependent variables. If the equation is ordinary, state whether it is linear or nonlinear.

- $\left(\frac{d^4 y}{dx^4}\right)^2 + 8y = 3x$
- $y''' - 5xy'' + 2yy' = x$
- $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2} + Q(x, t)$