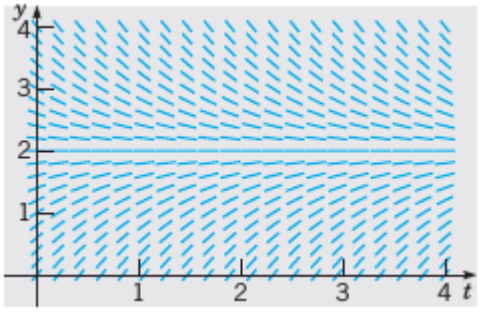
Ordinary Differential Equations - 10413181

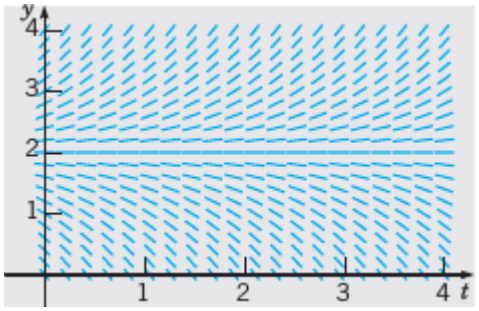
Homework No. 1

1. Given the following 6 graphs of direction fields (a) - (f), which show $y(t)$ plotted on the vertical axis and t on the horizontal axis, find the associated differential equation among 1. - 10. below.

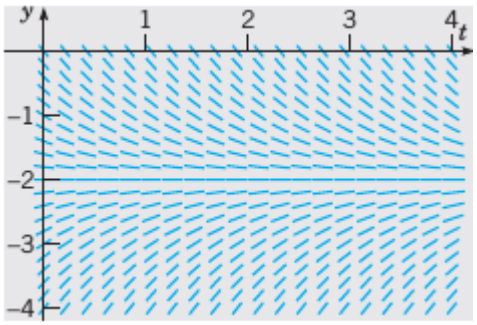
(a)



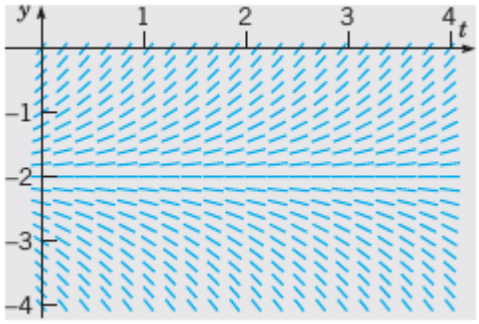
(b)



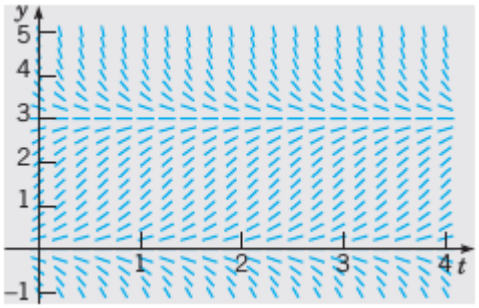
(c)



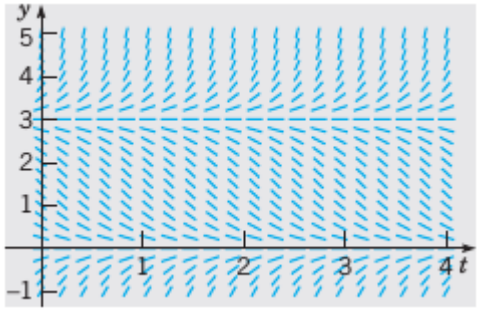
(d)



(e)



(f)



1. $y' = y(y+3)$
2. $y' = y - 2$
3. $y' = 2y - 1$
4. $y' = y(y-3)$
5. $y' = y(3-y)$
6. $y' = 1 + 2y$
7. $y' = 2 - y$
8. $y' = 1 - 2y$
9. $y' = -2 - y$
10. $y' = 2 + y$

2. For the following equations, determine the order of the differential equation, and state whether the equation is linear or nonlinear.

   (a) $\frac{dy}{dt} + ty^2 = 0$

   (b) $\frac{d^4y}{dt^4} + \frac{d^3y}{dt^3} + \frac{d^2y}{dt^2} + \frac{dy}{dt} + y = 1$

   (c) $t^2\frac{d^2y}{dt^2} + t\frac{dy}{dt} + 3y = \sin(t)$

   (d) $\frac{d^2y}{dt^2} + \cos(t+y) = \sin(t)$

(e) $(1+y^2)\frac{d^2y}{dt^2} + t\frac{dy}{dt} + y = e^t$

(f) $t\frac{dy}{dt} + y\cos^2(t) + \frac{d^3y}{dt^3} = t^3$

3. Solve

(a) $y' - \dfrac{2}{x^3}y = 0.$

(b) $y' + \dfrac{2}{x^3}y = 0,\ y(2) = 3.$

(c) $y' + \dfrac{2}{x^3}y = 0,\ y(0) = 3.$

(d) $y' + \dfrac{2}{x}y = \dfrac{\cos x}{x^2}.$