

Name: \_\_\_\_\_ Sort #: \_\_\_\_\_

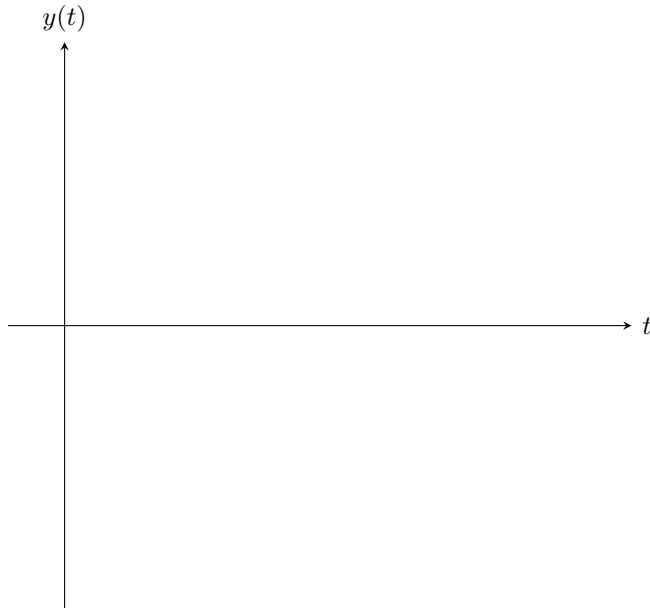
## Worksheet 1: Intro to ODEs

MATH 2310, Spring 2019

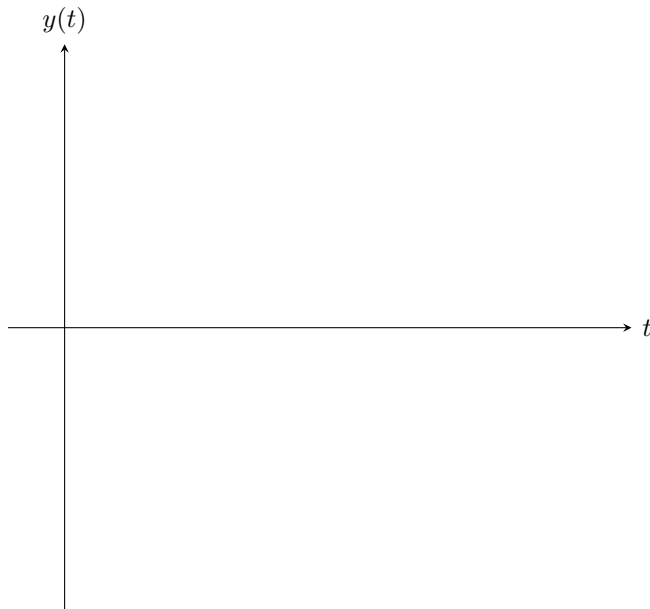
Grade: \_\_\_\_\_ / 40

1. Plot the direction field and solution curves for several values of  $y_0$ .

(a) (10 pts)  $y' = -1 - 2y$   $y(0) = y_0$



(b) (10 pts)  $y' = 2y - 10$ ;  $y(0) = y_0$



2. (8 pts) Verify that equation

$$t^2 y'' + 5ty' + 4y = 0, \quad t > 0$$

has solutions

$$y_1(t) = t^{-2}; \quad y_2(t) = t^{-2} \ln(t)$$

3. (12 pts) For each of the given differential equations, determine its order and whether it is linear or nonlinear.

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

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

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

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