

1. [1.3.9] Verify that  $y = 3t + t^2$  is a solution to  $ty' - y = t^2$ .

2. Given that  $yx^2 + e^{yx} = x + 1$ , find  $\frac{dy}{dx}$  in terms of  $y$  and  $x$ .

3. [1.1.23] Newton's law of cooling states that the temperature of an object changes at a rate proportional to the difference between the temperature of the object itself and the temperature of its surroundings (the ambient air temperature in most cases). Suppose that the ambient temperature is  $70^\circ\text{F}$  and that the rate constant is  $0.05(\text{min})^{-1}$ .

(a) Write a differential equation for the temperature  $M$  as a function of time  $t$ .

(b) Solve the initial value problem  $M(0) = 100^\circ$ .

(c) How long will it take for the object to cool to  $71^\circ$ ?