

## Applications of First-order Linear Differential Equations

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### Learning Objectives

- Solve first-order differential equations problems about compound interest
  - Solve first-order differential equations problems involving equilibrium price
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*Solve first-order differential equations problems about compound interest*

1. A bank account is opened with an initial deposit of \$12,000. The account earns 6.5% (continuously) compounded interest per year. Funds are withdrawn from the account at a rate of \$500 per year. Find the equation that models the amount of money in the account  $B$  at time  $t$ . Round your constants to the nearest penny.

*Solve first-order differential equations problems involving equilibrium price*

2. Suppose the demand,  $D = D(t)$ , and supply,  $S = S(t)$  for a certain commodity both depend on the price  $p = p(t)$  and the rate of change of price,  $p' = p'(t)$ , as given below:

$$D = 20 - 4p + 5p'$$

$$S = -15 + 3p + 6p'.$$

- a. You are given the initial condition  $p(0) = 12$ . Find the correct differential equation when the price is at equilibrium.

- b. Solve the resulting differential equation.

## ANSWER KEY

1.  $B(t) = 7692.31 + 4307.69e^{0.065t}$

2.  $p' + 7p - 35 = 0, p(0) = 12; p(t) = 5 + 7e^{-7t}$