

CHAPTER 1 PRACTICE PROBLEMS**Multiple Choice**

Identify the choice that best completes the statement or answers the question.

- _____ 1. The differential equation $y'' + 2y' + 3y = \sin y$ is
Select the correct answer.
- a. first order linear
 - b. second order linear
 - c. third order linear
 - d. first order nonlinear
 - e. second order nonlinear
- _____ 2. The values of m for which $y = e^{mx}$ is a solution of $y'' - 5y' + 6y = 0$ are
Select the correct answer. Show all work.
- a. 2 and 4
 - b. -2 and -3
 - c. 3 and 4
 - d. 2 and 3
 - e. 1 and 5
- _____ 3. The values of m for which $y = x^m$ is a solution of $x^2y'' - 5xy' + 8y = 0$ are
Select the correct answer. Show all work.
- a. 2 and 4
 - b. -2 and -4
 - c. 3 and 5
 - d. 2 and 3
 - e. 1 and 5
- _____ 4. The values of c for which $y = c$ is a constant solution of $y' = y^2 + 3y - 4$ are
Select the correct answer. Show all work.
- a. 1 and 4
 - b. -1 and -3
 - c. 1 and -4
 - d. -1 and 3
 - e. 1 and 3

- _____ 5. The values of m for which $y = e^{mx}$ is a solution of $y'' - 4y' - 5y = 0$ are
Select the correct answer. Show all work.
- a. 1 and 4
 - b. -1 and 4
 - c. 2 and 3
 - d. -2 and -3
 - e. -1 and 5
- _____ 6. The population of a town increases at a rate proportional to its population. Its initial population is 1000. The correct initial value problem for the population, $P(t)$, as a function of time, t , is
Select the correct answer.
- a. $\frac{dP}{dt} = kP, P(0) = 1000$
 - b. $\frac{dP}{dt} = kP^2, P(0) = 100$
 - c. $\frac{dP}{dt} = kP, P(0) = 100$
 - d. $\frac{dP}{dt} = kP(1 - P), P(0) = 100$
 - e. $\frac{dP}{dt} = kP^2, P(0) = 1000$
- _____ 7. The solution of the initial value problem $y' = 3y, y(0) = 2$ is $y = ce^{3x}$, where $c =$
Select the correct answer.
- a. 2
 - b. -2
 - c. 3
 - d. -3
 - e. 1
- _____ 8. The solution of the initial value problem $y' = 2y + x, y(1) = 1/4$ is $y = -x/2 - 1/4 + ce^{2x}$, where $c =$
Select the correct answer.
- a. 2
 - b. e^{-2}
 - c. e^{-1}
 - d. $e^{-2}/2$
 - e. 1

- _____ 9. The temperature of a cup of coffee obeys Newton's law of cooling. The initial temperature of the coffee is 150°F and one minute later, it is 135°F . The ambient temperature of the room is 70°F . If $T(t)$ represents the temperature of the coffee at time t , the correct differential equation for the temperature with side conditions is
- Select the correct answer.

- a. $\frac{dT}{dt} = k(T - 135)$
- b. $\frac{dT}{dt} = k(T - 150)$
- c. $\frac{dT}{dt} = k(T - 70)$
- d. $\frac{dT}{dt} = T(T - 150)$
- e. $\frac{dT}{dt} = T(T - 70)$

- _____ 10. A large mixing tank initially contains 100 gallons of water in which 30 pounds of salt have been dissolved. Another brine solution is pumped into the tank at the rate of 4 gallons per minute, and the resulting mixture is pumped out at the same rate. The concentration of the incoming brine solution is 2 pounds of salt per gallon. If $A(t)$ represents the amount of salt in the tank at time t , the correct differential equation for A is
- Select the correct answer.

- a. $\frac{dA}{dt} = 8 - .02A$
- b. $\frac{dA}{dt} = 8 - .04A$
- c. $\frac{dA}{dt} = 4 - .04A$
- d. $\frac{dA}{dt} = 2 - .04A$
- e. $\frac{dA}{dt} = 4 - .08A$