

Chapter 01 Form D: INTRODUCTION TO DIFFERENTIAL EQUATIONS**MULTIPLE CHOICE**

1. The differential equation $y''' + 2y'' + 3y' + 7y = 0$ 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

ANS: C PTS: 1

2. The differential equation $y'' + 2yy' + 3y = 0$ 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

ANS: E PTS: 1

3. The differential equation $y' + 3y = \sin x$ 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

ANS: A PTS: 1

4. 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

ANS: E PTS: 1

5. The differential equation $y''' + 2y'' + 3xy' - 4e^x y = \sin x$ 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

ANS: C PTS: 1

6. The values of m for which $y = e^{mx}$ is a solution of $y'' - 9y' + 20y = 0$ are
Select the correct answer.

- a. 4 and -5
- b. -4 and -5
- c. 3 and 6
- d. 4 and 5
- e. 3 and 5

ANS: D PTS: 1

7. The values of m for which $y = x^m$ is a solution of $x^2y'' - 7xy' + 12y = 0$ are
Select the correct answer.

- a. -3 and 4
- b. -2 and -6
- c. 3 and 4
- d. 2 and 6
- e. 3 and -4

ANS: A PTS: 1

8. The values of c for which $y = c$ is a constant solution of $y' = y^2 + 5y - 6$ are
Select the correct answer.

- a. 1 and 6
- b. -1 and 6
- c. 1 and -6
- d. -2 and 3
- e. 2 and 3

ANS: C PTS: 1

9. The values of m for which $y = e^{mx}$ is a solution of $y'' - 6y' - 7y = 0$ are
Select the correct answer.

- a. 1 and 7
- b. -1 and 6
- c. 1 and 6
- d. 1 and -6

e. -1 and 7

ANS: E PTS: 1

10. The population of a town increases at a rate proportional to its population. Its initial population is 5000. The correct initial value problem for the population, $P(t)$, as a function of time, t , is
Select the correct answer.

- a. $\frac{dP}{dt} = kP, P(0) = 5000$
b. $\frac{dP}{dt} = kP^2, P(0) = 500$
c. $\frac{dP}{dt} = kP, P(0) = 500$
d. $\frac{dP}{dt} = kP(1 - P), P(0) = 5000$
e. $\frac{dP}{dt} = kP^2, P(0) = 5000$

ANS: A PTS: 1

11. The solution of the initial value problem $y' = 5y, y(1) = 3$ is $y = ce^{5x}$, where $c =$
Select the correct answer.

- a. $3e^{-5}$
b. 3
c. $3e^5$
d. $-3e^5$
e. -3

ANS: A PTS: 1

12. The solution of the initial value problem $y' = 2y + x, y(-1) = 1/2$ is $y = -x/2 - 1/4 + ce^{2x}$, where $c =$
Select the correct answer.

- a. 2
b. $e^2/4$
c. e^2
d. $e^2/2$
e. 1

ANS: B PTS: 1

13. The initial value problem $y' = \sqrt{y^2 - 16}, y(x_0) = y_0$ has a unique solution guaranteed by Theorem 1.1 if
Select the correct answer.

- a. $y_0 = 4$
- b. $y_0 = -4$
- c. $y_0 = 0$
- d. $y_0 = 8$
- e. $y_0 = 1$

ANS: D PTS: 1

14. The temperature of a cup of coffee obeys Newton's law of cooling. The initial temperature of the coffee is 140°F and one minute later, it is 125°F . The ambient temperature of the room is 65°F . If $T(t)$ represents the temperature of the coffee at time t , the correct differential equation for the temperature is
Select the correct answer.

- a. $\frac{dT}{dt} = k(T - 125)$
- b. $\frac{dT}{dt} = k(T - 140)$
- c. $\frac{dT}{dt} = k(T - 65)$
- d. $\frac{dT}{dt} = T(T - 140)$
- e. $\frac{dT}{dt} = T(T - 65)$

ANS: C PTS: 1

15. In the previous problem, after a long period of time, the temperature of the coffee approaches
Select the correct answer.

- a. 125°F
- b. 100°F
- c. 65°F
- d. 50°F
- e. 0°F

ANS: C PTS: 1

16. In the *LRC* circuit problem in the text, R stands for
Select the correct answer.

- a. capacitance
- b. resistance
- c. current
- d. inductance
- e. charge on the capacitor

ANS: B PTS: 1

17. A large mixing tank initially contains 1000 gallons of water in which 40 pounds of salt have been dissolved. Another brine solution is pumped into the tank at the rate of 5 gallons per minute, and the resulting mixture is pumped out at the same rate. The concentration of the incoming brine solution is 3 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. $\frac{dA}{dt} = 3 - .005A$
- b. $\frac{dA}{dt} = 5 - .05A$
- c. $\frac{dA}{dt} = 15 - .005A$
- d. $\frac{dA}{dt} = 3 - .05A$
- e. $\frac{dA}{dt} = 15 + .05A$

ANS: C PTS: 1

18. In the previous problem, over a long period of time, the total amount of salt in the tank will approach
Select the correct answer.

- a. 300 pounds
- b. 500 pounds
- c. 1000 pounds
- d. 3000 pounds
- e. 5000 pounds

ANS: D PTS: 1

19. In the *LRC* circuit problem in the text, the units for C , are
Select the correct answer.

- a. ohms
- b. farads
- c. amperes
- d. henrys
- e. coulombs

ANS: B PTS: 1

20. In the falling body problem, the units of acceleration might be
Select the correct answer.

- a. centimeters per second
- b. feet per second
- c. feet per second per second
- d. kilograms per centimeter

e. kilograms per centimeter per second

ANS: C

PTS: 1