

MULTIPLE CHOICE

1. The differential equation $y'' + 2y' + 3y = 0$ 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: B 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 $y'' - 5y' + 6y = 0$ are
Select the correct answer.

- a. 2 and 4
- b. -2 and -3
- c. 3 and 4
- d. 2 and 3
- e. 1 and 5

ANS: D PTS: 1

7. The values of m for which $y = x^m$ is a solution of $x^2 y'' - 5xy' + 8y = 0$ are
Select the correct answer.

- a. 2 and 4
- b. -2 and -4
- c. 3 and 5
- d. 2 and 3
- e. 1 and 5

ANS: A PTS: 1

8. The values of c for which $y = c$ is a constant solution of $y' = y^2 + 3y - 4$ are
Select the correct answer.

- a. 1 and 4
- b. -1 and -3
- c. 1 and -4
- d. -1 and 3
- e. 1 and 3

ANS: C PTS: 1

9. The values of m for which $y = e^{mx}$ is a solution of $y'' - 4y' - 5y = 0$ are
Select the correct answer.

- a. 1 and 4
- b. -1 and 4

- c. 2 and 3
- d. -2 and -3
- e. -1 and 5

ANS: E PTS: 1

10. 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. $\frac{dP}{dt} = kP^2, P(0) = 1000$

ANS: A PTS: 1

11. 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

ANS: A PTS: 1

12. 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

ANS: B PTS: 1

13. The initial value problem $y' = \sqrt{y^2 - 9}$, $y(x_0) = y_0$ has a unique solution guaranteed by Theorem 1.1 if
Select the correct answer.

- a. $y_0 = 3$
- b. $y_0 = -3$
- c. $y_0 = 5$
- d. $y_0 = 0$
- e. $y_0 = 1$

ANS: C PTS: 1

14. 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. $\frac{dT}{dt} = T(T - 70)$

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. 120°F
- b. 100°F
- c. 70°F
- d. 65°F
- e. 0°F

ANS: C PTS: 1

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

- a. capacitance
- b. resistance

- c. current
- d. inductance
- e. charge on the capacitor

ANS: A PTS: 1

17. 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. $\frac{dA}{dt} = 4 - .08A$

ANS: B 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. 30 pounds
- b. 50 pounds
- c. 100 pounds
- d. 200 pounds
- e. 300 pounds

ANS: D PTS: 1

19. In the LRC circuit problem in the text, the units of inductance, L , are
Select the correct answer.

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

ANS: D PTS: 1

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

- a. meters per second
- b. feet per second
- c. meters per second per second
- d. kilograms per meter
- e. kilograms per meter per second

ANS: C

PTS: 1