**Chapter 4**

**Introduction to Differential Equations**

**4.1 Basics of Differential Equations**

**Section Exercises**

**Determine the order of the following differential equations.**

1. 

Answer: 1

3. 

Answer:

5. 

Answer:

7. 

Answer: 

**Verify that the following functions are solutions to the given differential equation.**

9. solves

Answer: This is a proof; therefore, no answer is provided.

11. solves

Answer: This is a proof; therefore, no answer is provided.

13. solves

Answer: This is a proof; therefore, no answer is provided.

15. solves

Answer: This is a proof; therefore, no answer is provided.

17. solves

Answer: This is a proof; therefore, no answer is provided.

**Verify the following general solutions and find the particular solution.**

19. Find the particular solution to the differential equation  that passes through given that is a general solution.

Answer:

21. Find the particular solution to the differential equation that passes through  given that is a general solution.

Answer:

23.  given that is a general solution.

Answer:

25. Find the particular solution to the differential equationthat passes through given that is a general solution.

Answer:

27. Find the particular solution to the differential equation that passes through given that is a general solution.

Answer:

**For the following problems, find the general solution to the differential equation.**

29. 

Answer:

31. 

Answer:

33. 

Answer: 

35. 

Answer:

37. 

Answer:

**Solve the following initial-value problems starting from and  Draw both solutions on the same graph.**

39. 

Answer:

41. 

Answer:

**Solve the following initial-value problems starting fromAt what time does increase to or drop to **

43. 

Answer:

45. 

Answer:

47. 

Answer: never

**Recall that a family of solutions includes solutions to a differential equation that differ by a constant. For the following problems, use your calculator to graph a family of solutions to the given differential equation. Use initial conditions from  to increasing by  Is there some critical point where the behavior of the solution begins to change?**

49. **[T]** 

Answer: Solution changes from increasing to decreasing at

51. **[T]**(hint:is the general solution)

Answer: Solution changes from increasing to decreasing at

53. Find the general solution to describe the velocity of a ball of mass that is thrown upward at a rate ft/sec.

Answer:

55. You throw two objects with differing masses andupward into the air with the same initial velocity ft/s. What is the difference in their velocity after second?

Answer:ft/s

57. **[T]** For the previous problem, use your calculator to approximate how much higher the ball went on Mars.

Answer: meters

59. **[T]** For the car in the preceding problem, find the expression for the distance the car has traveled in time  assuming an initial distance of How long does it take the car to travel miles? Round your answer to hours and minutes.

Answer:hours minute

61. Substituteintoto find a particular solution.

Answer:

63. Substitute intoto find a particular solution.

Answer:

65. Solvewith the initial condition  and solvewith the same initial condition. As approaches what do you notice?

Answer:and

This file is copyright 2016, Rice University. All Rights Reserved.