MAC 2233

Differential Equations

Instr Jamieson

Ch. 7 Sec. 6

Solve explicitly or implicitly as indicated.

1. Implicitly; $\frac{dy}{dt} - \frac{4t^3}{2y + 5y^4} = 0$

2. Implicitly; $\frac{dy}{dt} - \frac{4t^3}{2y + e^y} = 0$

3. Implicitly; $\left(y + e^y\right)\frac{dy}{dt} - t = 0$

4. Implicitly; $\frac{dy}{dt} - \frac{t}{1 + e^y} = 0$

5. Implicitly; $\frac{dy}{dt} - \frac{t}{1 + y^2} = 0$

6. Explicitly; $\frac{1}{t^3}\frac{dy}{dt} - 4y^2 = 0$

7. Explicitly; $e^y \frac{dy}{dt} - 3t^2 = 0$

8. Explicitly; $\frac{1}{1 + y}\frac{dy}{dt} - 2t = 0; y > 0, t > 0$

9. Explicitly; $2y\frac{dy}{dt} - e^t = 0$

10. Explicitly; $\frac{dy}{dt} = \frac{t^4}{y^6}$

11. Explicitly; $\frac{i}{t^3}\frac{dy}{dt} - 4y^2 = 0$

12. Explicitly; $e^y \frac{dy}{dt} - t^2 = 1$

13. Explicitly; $\frac{3}{y}\frac{dy}{dt} - e^t = 0$

14. Explicitly; $\frac{1}{1 + t^2}\frac{dy}{dt} - \frac{1}{y} = 0$

Solve implicitly for two points. One bonus point for explicit solution:

15. $\frac{dy}{dt} - \frac{t}{1 + y} = 0$

16. $\frac{dy}{dt} - \frac{6t^5}{1 + y} = 0$

17. $\frac{dy}{dt} - \frac{e^t}{1 + y} = 0$

Differential Equations

Answers:

1. $\int (2y+5y^4)dy = \int 4t^3dt$

$y^2 + y^5 = t^4 + c$

2. $2y + e^y dy = 4t^3 dt$

$\int 2y + e^y dy = \int 4t^3 dt$

$y^2 + e^y = t^4 + c$

3. $\frac{1}{t^3}\frac{dy}{dt} = 4y^2$

$y^{-2}dy = 4t^3 dt;$

$\frac{y^{-1}}{-1} = t^4 + c;\ y = \frac{-1}{t^4 + c}$

4. $e^y dy = 3t^2 dt$

$e^y = t^3 + c$

$y = \ln(t^3 + c)$

5. $y + \frac{y^3}{3} = \frac{t^2}{2} + c$

6. $y = \pm\sqrt{2\left(\frac{t^3}{3} + t + C\right)}$

7. $y + \frac{y^2}{2} = \frac{t^2}{2} + C$

$y = \frac{-2 \pm \sqrt{2^2 + 4\left(t^2 + 2C\right)}}{2}$

8. $\frac{1}{1+y}\frac{dy}{dt} = 2t$

$\frac{1}{1+y}dy = 2tdt$

$\ln(1+y) = t^2 + c$

$y = e^{t^2+c} - 1$

9. $2y\frac{dy}{dt} - e^t = 0$

$2y\frac{dy}{dt} = e^t$

$2ydy = e^t dt$

$y^2 = e^t + c$

$y = \pm\sqrt{e^t + c}$

10. $y = \left(7\frac{t^5}{5} + C\right)^{1/7}$

11. $y = \frac{-1}{t^4 + C}$

12. $y = \ln\left(\frac{t^3}{3} + t + C\right)$

13. $y = e^{\left(\frac{e^t + C}{3}\right)}$

14. $\frac{y^2}{2} + e^y = \frac{t^2}{2} + C$

15. $y + e^y = \frac{t^2}{2} + c$

16. $y + \frac{y^2}{2} = t^6 + C$

$y = \frac{-2 \pm \sqrt{2^2 + 8\left(t^6 + C\right)}}{2}$

17. $y + \frac{y^2}{2} = e^t + C$

$y = \frac{-2 \pm \sqrt{2^2 + 8\left(e^t + C\right)}}{2}$