

# Differential Equations 244

## Exam 2 Review Answers

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1.

$$y = c_1 e^{3t} + c_2 e^{-t} - t \frac{1}{3} + \frac{2}{9} - e^{2t} - \frac{1}{4} t e^{-t}$$

2.

$$y = c_1 e^{-2t} + c_2 t e^{-2t} + 1 + \frac{5}{2} t^2 e^{-2t}$$

3.

$$y = c_1 \cos(t) + c_2 \sin(t) - \frac{2}{3} \cos(2t) - t \cos(t)$$

4.

$$y = e^{-2t} (-\ln(t) + c_1) + t e^{-2t} \left( -\frac{1}{t} + c_2 \right)$$

5.

$$y = t^2 \left( \ln(t) + \frac{1}{6} t^{-2} + c_1 \right) + t^{-1} \left( -\frac{1}{3} t^3 + \frac{1}{3} t + c_2 \right)$$

6.

$$y = 2e^{-10t} \cos(4\sqrt{6}t) + \frac{5}{\sqrt{6}} e^{-10t} \sin(4\sqrt{6}t)$$

7.

$$\gamma = 4$$

8.

9.  $W = 1$ , functions are linearly independent

10.  $W = 0$ , so the functions may be dependent; they are in fact dependent, since  $3(t)+1=3t+1$

11.

$$y = c_1 e^t + c_2 t e^t + c_3 e^{-t}$$

12.

$$y = c_1 \cos(t) + c_2 \sin(t) + c_3 t \cos(t) + c_4 t \sin(t)$$

13.

$$y = c_1 \cos(t) + c_2 \sin(t) + c_3 e^{t\frac{\sqrt{3}}{2}} \cos(t/2) + c_4 e^{t\frac{\sqrt{3}}{2}} \sin(t/2) + c_5 e^{-t\frac{\sqrt{3}}{2}} \cos(t/2) + c_6 e^{-t\frac{\sqrt{3}}{2}} \sin(t/2)$$

14.

$$y = c_1 e^t + c_2 t e^t + c_3 e^{-t} + 3 + \frac{1}{2} t e^{-t}$$

15.

$$y = c_1 + c_2 t + c_3 t^2 + c_4 e^{-t} + \frac{1}{40} \cos(2t) + \frac{1}{20} \sin(2t)$$

16.

$$y = c_1 + c_2 t + c_3 t^2 + c_4 e^{-t} + c_5 e^{\frac{t}{2}} \cos\left(t\frac{\sqrt{3}}{2}\right) + c_6 e^{\frac{t}{2}} \sin\left(t\frac{\sqrt{3}}{2}\right)$$

17.

18.

$$a_{n+2} = \frac{a_n}{(n+2)(n+1)}$$

19.

20.

$$x_0 = 1, R = 1; x_0 = 2, R = 2$$

21. 0 irregular singular; -1,1 regular singular

22.

$$c_1 x^2 + c_2 \ln(x) x^2$$

23.

$$c_1 x^{\frac{3}{2}} \cos\left(\ln(x) \frac{\sqrt{3}}{2}\right) + c_2 x^{\frac{3}{2}} \sin\left(\ln(x) \frac{\sqrt{3}}{2}\right)$$