

# EMCF Quiz 6 Due February 19 at 11:59 PM

1.  $z_1(x) = 2x^3 + x \ln x$ ,  $z_2(x) = x \ln x - x^3$  are solutions of a second order, linear nonhomogeneous equation  $L[y] = f(x)$ .  $y_1(x) = x^2$  is a solution of the corresponding reduced equation  $L[y] = 0$ . The general solution of  $L[y] = f(x)$  is:

- (a)  $z = C_1x^2 + C_2x^3 + C_3x \ln x$
- (b)  $z = C_1x^2 + C_2(x^3 + x \ln x)$
- (c)  $z = C_1x^2 + C_2x \ln x$
- (d)  $z = C_1x^2 + C_2x^3 + x \ln x$
- (e) None of the above.

2.  $z_1(x) = 3e^{2x} + 2 \tan 2x$ ,  $z_2(x) = 4e^{3x} + 2 \tan 2x$ ,  $z_3(x) = 4e^{3x} + 2e^{2x} + 2 \tan 2x$  are solutions of a second order, linear nonhomogeneous equation  $L[y] = f(x)$ . The general solution of  $L[y] = f(x)$  is:

- (a)  $z = C_1(3e^{2x} + 2 \tan 2x) + C_2(e^{3x} + 2 \tan 2x)$
- (b)  $z = C_1e^{2x} + C_2e^{3x} + 2 \tan 2x$
- (c)  $z = C_1e^{2x} + C_2e^{3x} + C_3 \tan 2x$
- (d)  $z = C_1(2 \tan 2x) + C_2(4e^{3x} + 2e^{2x})$
- (e) None of the above.

3.  $\{y_1(x) = x^{-6}, y_2(x) = x^2\}$  is a fundamental set of solutions of the reduced equation of

$$y'' + \frac{5}{x}y' - \frac{12}{x^2}y = 4x^2.$$

A particular solution of the equation is:

- (a)  $z = \frac{x^4}{5}$
- (b)  $z = \ln x^3$
- (c)  $z = \frac{2x^2}{5}$
- (d)  $z = \frac{x^3}{5}$
- (e) None of the above.

4.  $\{y_1(x) = x^{-1}, y_2(x) = x^3\}$  is a fundamental set of solutions of the reduced equation of

$$y'' - \frac{1}{x}y' - \frac{3}{x^2}y = 3x.$$

A particular solution of the equation is:

- (a)  $z = -3x^{-1} \ln x$
  - (b)  $z = x^3 \ln x$
  - (c)  $z = \frac{3}{4}x^3 \ln x$
  - (d)  $z = \frac{3}{4} \ln x^3$
  - (e) None of the above.
5.  $\{y_1(x) = x, y_2(x) = x \ln x\}$  is a fundamental set of solutions of the reduced equation of

$$y'' - \frac{1}{x}y' + \frac{1}{x^2}y = \frac{2}{x}.$$

The general solution of the equation is:

- (a)  $y = C_1x + C_2x \ln x + x(\ln x)^2$
  - (b)  $y = C_1x + C_2x \ln x + 2x \ln x$
  - (c)  $y = C_1x + C_2x \ln x - x^2(\ln x)$
  - (d)  $y = C_1x + C_2x \ln x + x^2 \ln x - x(\ln x)^2$
  - (e) All of the above.
6.  $\{y_1(x) = x, y_2(x) = x^2\}$  is a fundamental set of solutions of the reduced equation of

$$x^2y'' - 2xy' + 2y = 6x^2.$$

The general solution of the equation is:

- (a)  $y = C_1x + C_2x^2 + x^4$
- (b)  $y = C_1x + C_2x^2 + 6x^2 \ln x$
- (c)  $y = C_1x + C_2x^2 + 5x^4 + x^2 \ln x$
- (d)  $y = C_1x + C_2x^2 + x^4 - 2x^3$
- (e) None of the above.

7. A particular solution of  $y'' + 4y' + 4y = \frac{e^{-2x}}{x}$  is:

- (a)  $y = xe^{-2x} \ln x$
- (b)  $y = 2x^2e^{-2x}$
- (c)  $y = -xe^{-2x} \ln x$
- (d)  $y = -xe^{2x}(1 + \ln x)$
- (e) None of the above.

8. The general solution of  $y'' - 6y' + 9y = \frac{e^{3x}}{x^2}$  is:

- (a)  $y = C_1e^{3x} + C_2xe^{3x} + 2e^{3x} \ln x$
- (b)  $y = C_1e^{3x} + C_2xe^{3x} - e^{3x} \ln x$
- (c)  $y = C_1e^{3x} + C_2xe^{3x} + \frac{e^{3x}}{x}$
- (d)  $y = C_1e^{3x}x + C_2xe^{3x} - xe^{3x} \ln x$
- (e) None of the above.

9. A particular solution of  $y'' + 9y = 3 \sec 3x$  is

- (a)  $z = \frac{1}{3} \cos 3x \ln |\sec 3x| + x$
- (b)  $z = -3 \sin 3x \ln |\sec 3x + \tan 3x|$
- (c)  $z = -\frac{1}{3} \cos 3x \ln |\sec 3x| + x \sin 3x$
- (d)  $z = \frac{1}{3} \sin 3x \ln |\sec 3x + \tan 3x| + x \cos 3x$
- (e) None of the above.

10. The general solution of  $y'' + 4y = 2 \tan 2x$  is:

- (a)  $y = C_1 \cos 2x + C_2 \sin 2x - \frac{1}{2} \cos 2x \ln |\sec 2x + \tan 2x|$ .
- (b)  $y = C_1 \cos 2x + C_2 \sin 2x + \frac{1}{2} \cos 2x \ln |\sec 2x + \tan 2x|$ .
- (c)  $y = C_1 \cos 2x + C_2 \sin 2x - \sin 2x \ln |\sec 2x + \tan 2x|$ .
- (d)  $y = C_1 \cos 2x + C_2 \sin 2x - \cos 2x \ln |\sec 2x + \tan 2x|$ .
- (e) None of the above.

11. The general solution of  $y'' - 2y' - 8y = 10e^{3x} + 2$  is:

- (a)  $y = C_1e^{-4x} + C_2e^{2x} - 2e^{3x} - \frac{1}{4}$
- (b)  $y = C_1e^{4x} + C_2e^{-2x} + 2e^{3x} - 4$
- (c)  $y = C_1e^{-4x} + C_2e^{2x} - 2e^{3x} + \frac{1}{4}$
- (d)  $y = C_1e^{4x} + C_2e^{-2x} + 2e^{3x} - \frac{1}{4}$
- (e) None of the above.

12. The general solution of  $y'' - y' - 2y = 4 \cos 2x + 2 \sin 2x$  is:

(a)  $y = C_1 e^{2x} + C_2 e^{-x} - \frac{1}{2} \cos 2x - \frac{1}{2} \sin 2x$

(b)  $y = C_1 e^{-2x} + C_2 e^x + \frac{1}{4} \cos 2x - \frac{1}{2} \sin 2x$

(c)  $y = C_1 e^{-2x} + C_2 e^x + \frac{1}{2} \cos 2x + \frac{1}{2} \sin 2x$

(d)  $y = C_1 e^{2x} + C_2 e^{-x} + \frac{1}{2} \cos 2x - \frac{1}{2} \sin 2x$

(e) None of the above.

13. A particular solution of  $y'' - 6y' + 8y = 6e^{4x} - 4$  is:

(a)  $z = 3xe^{4x} - \frac{1}{2}$

(b)  $z = 2x^2 e^{4x} - 2$

(c)  $z = 2xe^{4x} - \frac{2}{3}$

(d)  $z = 3e^{4x} - \frac{1}{2}$

(e) None of the above.

14. A particular solution of  $y'' - 6y' + 9y = 4e^{3x} + 3$  is:

(a)  $z = \frac{1}{9} + 2xe^{3x}$

(b)  $z = 2x^2 e^{3x} + 3$

(c)  $z = 2x^2 e^{3x} + \frac{1}{3}$

(d)  $z = 2e^{3x} + \frac{1}{3}$

(e) None of the above.

15. The general solution of  $y'' - 2y' + y = 2e^{3x} + 8e^{-3x}$  is

(a)  $y = C_1 e^x + C_2 x e^x + \frac{2}{27} \tan^{-1}(\ln 2x) + 4 \ln(31) - \frac{1}{3}$

(b)  $y = C_1 e^x + C_2 x e^x + \cosh 3x$

(c)  $y = C_1 e^x + C_2 x e^x + \frac{1}{2} \int_0^x 4e^{\sin t^2} dt$

(d)  $y = C_1 e^x + C_2 x e^x + 3 \sin^{-1} [\tan 5 \ln(3x - 1)] + 72\pi$

(e) None of the above.