
3521 Fall 2010 R01 & R02 Multiple Choice Section of Final

Out[4]=

(1)

The solution of $y' - y = x$ is
Select the correct answer.

- (a) $y = -x - 1 + ce^{-x}$
- (b) $y = x - 1 + ce^{-x}$
- (c) $y = x - 1 + ce^x$
- (d) $y = -x + 1 + ce^x$
- (e) $y = -x - 1 + ce^x$

(2)

The solution of $y \sec^2 x dx + \tan x dy = 0$ is
Select the correct answer.

- (a) $y \tan x$
- (b) $y \cot x$
- (c) $y \tan x = c$
- (d) $y \cot x = c$
- (e) $y \cot x - c$

(3)

The solution of $y'' - 6y' + 9y = 0$ is
Select the correct answer.

- (a) $y = c_1 e^{3x} + c_2 x e^{3x}$
- (b) $y = c_1 e^{-6x} + c_2 e^{-3x}$
- (c) $y = c_1 e^{(7+\sqrt{13})x/2} + c_2 e^{(7-\sqrt{13})x/2}$
- (d) $y = c_1 e^{7x/2} \cos(\sqrt{13}x/2) + c_2 e^{7x/2} \sin(\sqrt{13}x/2)$
- (e) $y = c_1 e^{-3x} + c_2 x e^{-3x}$

- (4) The solution of $y'' - 4y' + 13y = 0$ is
Select the correct answer.

- (a) $y = c_1 e^{-2x} \cos(3x) + c_2 e^{2x} \sin(3x)$
 (b) $y = c_1 e^{-2x} \cos(3x) + c_2 e^{-2x} \sin(3x)$
 (c) $y = c_1 e^{2x} \cos(3x) + c_2 e^{2x} \sin(3x)$
 (d) $y = c_1 e^{2x} + c_2 e^{2x}$
 (e) $y = c_1 \cos(3x) + c_2 \sin(3x)$

- (5) A 1-kilogram mass is hung on a spring with a spring constant of $4N/m$. The mass spring system is then put into motion in a medium offering a damping force numerically equal to four times the velocity. If the mass is pulled down 10 centimeters from equilibrium and released, and a forcing function equal to $2e^{-3t}$ is applied to the system, the initial value problem describing the position, $x(t)$, of the mass at time t is
Select the correct answer.

- (a) $x'' - 4x' + 4x = 2e^{-3t}$, $x(0) = .1$, $x'(0) = 0$
 (b) $x'' + 4x' + 4x = 2e^{-3t}$, $x(0) = .1$, $x'(0) = 0$
 (c) $x'' - 4x' + 4x = 2e^{-3t}$, $x(0) = 10$, $x'(0) = 0$
 (d) $x'' + 4x' + 4x = 2e^{-3t}$, $x(0) = 10$, $x'(0) = 0$
 (e) $x'' + 4x = 4 + 2e^{-3t}$, $x(0) = 10$, $x'(0) = 0$

- (6) In the previous problem, the solution for the position, $x(t)$, is
Select the correct answer.

- (a) $x = 2.2e^{-2t} - 1.9te^{-2t} + 2e^{-3t}$
 (b) $x = 2.2e^{-2t} + 1.9te^{-2t} + 2e^{-3t}$
 (c) $x = 2.2e^{-2t} - 1.9te^{-2t} - 2e^{-3t}$
 (d) $x = 1.9e^{-2t} + 2.2te^{-2t} + 2e^{-3t}$
 (e) $x = -1.9e^{-2t} + 2.2te^{-2t} + 2e^{-3t}$

(7) The solution of $y' + y = x$ is
Select the correct answer.

- (a) $y = x - 1 + ce^x$
- (b) $y = -x + 1 + ce^x$
- (c) $y = -x - 1 + ce^x$
- (d) $y = -x - 1 + ce^{-x}$
- (e) $y = x - 1 + ce^{-x}$

(8) The solution of $y \cos x dx + \sin x dy = 0$ is
Select the correct answer.

- (a) $y \sin x$
- (b) $y \cos x$
- (c) $y \sin x = c$
- (d) $y \cos x = c$
- (e) $y \cos x - c$

(9) The solution of $y'' + 4y' - 5y = 0$ is
Select the correct answer.

- (a) $y = c_1 e^{-x} + c_2 e^{5x}$
- (b) $y = c_1 e^x + c_2 e^{5x}$
- (c) $y = c_1 e^x + c_2 e^{-5x}$
- (d) $y = c_1 e^{-x} + c_2 x e^{-5x}$
- (e) $y = c_1 e^{2x} + c_2 e^{3x}$

(10) Two linearly independent solutions of the differential equation $y'' - 6y' + 25y = 0$ are
Select the correct answer.

- (a) $y_1 = e^{3x}, y_2 = e^{4x}$
- (b) $y_1 = e^{-3x}, y_2 = e^{-4x}$
- (c) $y_1 = e^{-3x} \cos(4x), y_2 = e^{-3x} \sin(4x)$
- (d) $y_1 = e^{3x} \cos(4x), y_2 = e^{3x} \sin(4x)$
- (e) $y_1 = e^{4x} \cos(3x), y_2 = e^{4x} \sin(3x)$

(11) The solution of $y'' - 6y' + 13y = 0$ is
Select the correct answer.

- (a) $y = c_1 e^{-3x} \cos(2x) + c_2 e^{3x} \sin(2x)$
- (b) $y = c_1 e^{-3x} \cos(2x) + c_2 e^{-3x} \sin(2x)$
- (c) $y = c_1 e^{3x} \cos(2x) + c_2 e^{3x} \sin(2x)$
- (d) $y = c_1 e^{3x} + c_2 e^{3x}$
- (e) $y = c_1 \cos(2x) + c_2 \sin(2x)$

(12) The correct form of the particular solution of $y'' - 3y' + 2y = e^x$ is
Select the correct answer.

- (a) $y_p = Ax^2 e^x$
- (b) $y_p = Ax^3 e^x$
- (c) $y_p = Ae^x$
- (d) $y_p = Axe^x$
- (e) none of the above

(13) The solution of the differential equation $y' = xy$ is
Select the correct answer.

- (a) $y = ce^x$
- (b) $y = ce^{x^2}$
- (c) $y = c + e^x$
- (d) $y = ce^{x^2/2}$
- (e) $y = c + e^{x^2/2}$

(14) The solution of $(x + 2y)dx + ydy = 0$ is
Select the correct answer.

- (a) $\ln x + \ln(y + x) = c$
- (b) $\ln((y + x)/x) = c$
- (c) $\ln(y + x) + x/(y + x) = c$
- (d) $\ln(y + x) + x/(y + x) + c$
- (e) it cannot be solved

(15) The solution of the differential equation $y' - y/x = y^2$ is
Select the correct answer.

- (a) $y = c/x - x/2$
- (b) $y = 1/(c/x - x/2)$
- (c) $y = (cx - x \ln x)$
- (d) $y = 1/(cx - x \ln x)$
- (e) $y = 1 + ce^x$

(16) Solve the problem $y' = (x + 1)y$, $y(0) = 1$ numerically for $y(0.2)$ using $h = 0.1$.
Select the correct answer.

- (a) 1.1
- (b) 1.11
- (c) 1.2
- (d) 1.21
- (e) 1.221

(17) A particular solution of the differential equation $y'' - 2y' + y = e^x$ is
Select the correct answer.

- (a) $y_p = x^2 e^x / 2$
- (b) $y_p = x e^x / 2$
- (c) $y_p = x e^x$
- (d) $y_p = e^x$
- (e) $y_p = e^{-x} / 4$

(18) Without solving for the undetermined coefficients, the correct form of a particular solution of the differential equation $y'' + 4y' + 5y = e^{-2x} \cos x$ is
Select the correct answer.

- (a) $y_p = Ae^{-2x} \cos x$
- (b) $y_p = Ae^{-2x} \cos x + Be^{-2x} \sin x$
- (c) $y_p = Ae^{-2x} \sin x$
- (d) $y_p = Axe^{-2x} \cos x + Bxe^{-2x} \sin x$
- (e) $y_p = Axe^{-2x} \cos x + Be^{-2x} \sin x$

- (19) The solution of the differential equation $x^2y'' + 3xy' + y = 0$ is
Select the correct answer.
- (a) $y = c_1x^{-1} + c_2x^{-1} \ln x$
 - (b) $y = c_1x^{-1} + c_2x^{-2}$
 - (c) $y = c_1x^{(-3+\sqrt{5})/2} + c_2x^{(-3-\sqrt{5})/2}$
 - (d) $y = c_1x + c_2x \ln x$
 - (e) $y = c_1x + c_2x^2$

- (20) Two linearly independent solutions of the differential equation $y'' - 4y' + 5y = 0$ are
Select the correct answer.
- (a) $y_1 = e^x, y_2 = e^{5x}$
 - (b) $y_1 = e^{-x}, y_2 = e^{-5x}$
 - (c) $y_1 = e^{2x} \cos x, y_2 = e^{2x} \sin x$
 - (d) $y_1 = e^x \cos(2x), y_2 = e^x \sin(2x)$
 - (e) $y_1 = e^{-x} \cos(2x), y_2 = e^{-2x} \sin(2x)$

- (21) Two linearly independent solutions of the differential equation $y'' + 6y' + 9y = 0$ are
Select the correct answer.
- (a) $y_1 = e^{3x}, y_2 = xe^{3x}$
 - (b) $y_1 = e^{-3x}, y_2 = xe^{-3x}$
 - (c) $y_1 = e^{3x}, y_2 = e^{-3x}$
 - (d) $y_1 = e^{3x} \cos(x), y_2 = e^{3x} \sin(x)$
 - (e) $y_1 = e^{-3x} \cos(3x), y_2 = e^{-3x} \sin(x)$

- (22) The solution of the differential equation $x^2y'' - 5xy' + 5y = 0$ is
Select the correct answer.
- (a) $y = c_1x + c_2x^5$
 - (b) $y = c_1x^2 \cos(\ln x) + c_2x^2 \sin(\ln x)$
 - (c) $y = c_1x \cos(2 \ln x) + c_2x \sin(2 \ln x)$
 - (d) $y = c_1x^{(5+\sqrt{5})/2} + c_2x^{(5-\sqrt{5})/2}$
 - (e) $y = c_1e^{2x} \cos x + c_2xe^{2x} \sin x$

(23) A particular solution of the differential equation $y'' + 2y' - 8y = e^{2x}$ is
Select the correct answer.

- (a) $y_p = xe^{2x}/6$
- (b) $y_p = xe^{2x}/2$
- (c) $y_p = x^2e^{2x}/6$
- (d) $y_p = xe^{2x}$
- (e) $y_p = e^{2x}$

(24) A spring attached to the ceiling is stretched one foot by a four pound weight. The value of the Hooke's Law spring constant, k is
Select the correct answer.

- (a) 4 pounds per foot
- (b) 1/4 pound per foot
- (c) 1/4 foot pound
- (d) 4 foot pounds
- (e) none of the above

(25) In the previous problem, if the mass is set in motion, the natural frequency, ω , is
Select the correct answer.

- (a) $4\sqrt{2}\text{sec}$
- (b) $4\sqrt{2}\text{sec}^{-1}$
- (c) 32 sec
- (d) 32sec^{-1}
- (e) sec^{-1}