Answers Tutorial 2

Q.2 a) (i) $\cosh\frac{x}{2} + \sinh\frac{x}{2}$

(ii) $\sinh\frac{x}{2} + \cosh\frac{x}{2}$

(iii) $2e^{x/2}$

b) (i) $(-9\sin x - 2\cos x)e^{-3x}$

(ii) $16e^{3x}$

(iii) $-5x^2 + 8x + 2$

c) (i) $-12x^3 + 9x^2 + 8x - 2$

(ii) $-28\sin 4x - 4\cos 4x$

(iii) 0

Q.3. a) Linearly Independent

b) Linearly Independent

c) Linearly Dependent

d) Linearly Independent.

Q.4. a) $y'' + 2y' = 0$

b) $y'' + 2sy' + (s^2 + t^2)y = 0$

c) $y^{iv} + 4y'' = 0$

d) $y^{iv} - 2y'' + 1 = 0$

e) $x^2y'' - 4xy' + 6y = 0$

f) $x^2y'' - xy' + y = 0$

Q.6 a) $y(x) = C_1 e^{0.9x} + C_2 e^{-1.1x}$

b) $y(x) = e^{0.5x}[A\cos 1.5x + B\sin 1.5x]$

c) $y(x) = C_1 e^{2/3 x} + C_2 e^{-8/3 x}$

d) $y(x) = C_1 e^{x} + C_2 e^{-x} + C_3 e^{-2x} + C_4 e^{-3x}$

e) $y(x) = C_1 e^{-x} + e^{x/2}[A\cos\sqrt{3}x + B\sin\sqrt{3}x]$

f) $y(x) = C_1 e^{4.116x} + C_2 e^{-4.116x} + C_3 e^{1.06x} + C_4 e^{-1.06x}$

g) $y(x) = C_1 e^{1.84x} + e^{-0.42x}[A\cos 0.6x + B\sin 0.6x]$

h) $y(x) = C_1 e^{x} + C_2 e^{-x} + A\cos 2x + B\sin 2x$

i) $y(x) = (C_1 + C_2 \ln x)\frac{1}{x}$

j) $y(x) = x[A\cos(\ln x) + B\sin(\ln x)]$

Q.7 a) $y(x) = (C_1 + xC_2)e^{-2x}$

b) $y(x) = e^{\frac{\sqrt{2}k}{2}x}\left[A\cos\frac{\sqrt{2}k}{2}x + B\sin\frac{\sqrt{2}k}{2}x\right]$
$+ e^{-\frac{\sqrt{2}k}{2}}\left[C\cos\frac{\sqrt{2}k}{2}x + D\sin\frac{\sqrt{2}k}{2}x\right]$

c) $y(x) = C_1 e^{3x} + A\cos 3x + B\sin 3x$

d) $y(x) = (C_1 + xC_2)e^{x} + A\cos x + B\sin x$

e) $y(x) = C_1\cos 2x + C_2\sin 2x + C_3 x\cos 2x + C_4 x\sin 2x$

f) $y(x) = C_1\cos(\ln x) + C_2\sin(\ln x)$

g) $y(x) = C_1 x^{1.6} + C_2 x^{1.4}$

h) $y(x) = \frac{C_1}{x^3} + \frac{C_2}{x}$

Q. 8) a) $y(x) = 2 + e^{-11x}$

b) $y(x) = 8.85e^{-0.32x} + 0.145\, e^{-17.687x}$

c) $y(x) = 2.4\left[-e^{6x} + e^{-4x}\right]$

d) $y(x) = -3.23 + e^{-1.6x}\left[6.63\cos(1.5x) + 4\sin(1.5x)\right]$

e) $y(x) = 0.7e^{5x} + 0.68e^{-5x} + 2.01\cos 4x - 0.02\sin 4x$

Q. 10. a) $y(x) = C_1e^{2x} + C_2e^{-2x} - \frac{5}{2}e^{x}$

b) $y(x) = C_1e^{-\frac{1}{3}x} + C_2e^{-3x} + (3x - 10) + \frac{1}{5}\sin x$

c) $y(x) = (C_1 + C_2x)e^{-5x} + e^{-x}(6\cos x + 8\sin x)$

d) $y(x) = e^{-x}\left[A\cos 3x + B\sin 3x\right] + (2.5x^2 - x)$

e) $y(x) = (C_1 + C_2x)e^{-2x} + e^{x} + 9e^{-x}$

f) $y(x) = C_1 + C_2e^{-x} + \frac{1}{3}x^3 + 2x$

g) $y(x) = C_1e^{-3x} + C_2e^{2x} - (x^3 + 8x + \frac{1}{2})$

h) $y(x) = (C_1 + C_2x)e^{-5x} + 50\left(\frac{e^{x}}{36} - \frac{e^{-x}}{6}\right)$

i) $y(x) = C_1 + C_2e^{2x} + 6e^{2x} - e^{-2x}$

j) $y(x) = C_1 + C_2e^{3x} - \left(\frac{x^4}{36} + \frac{x^3}{81} + \frac{x^2}{243} + \frac{2x}{2187}\right) + \frac{e^{2x}}{14}\left[\frac{\cos 3x}{30} - \frac{\sin 3x}{90}\right]$

k) $y(x) = C_1 + C_2\cos x + C_3\sin x + x^3 - 6x - (-2\sin x + \cos x)x$