Unit 3 - Week 01

Assignment 1

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2019-08-14, 23:59 IST.

1) The adjoint equation of the differential equation $x^2\frac{d^2y}{dx^2}+(2x^3+1)\frac{dy}{dx}+y=0$ is *1 point*

a. $x^2\frac{d^2y}{dx^2}+(2x^3-1)\frac{dy}{dx}+6x^2y=0$
b. $x^2\frac{d^2y}{dx^2}+(4x-2x^3-1)\frac{dy}{dx}+(3-6x^2)y=0$
c. $x^2\frac{d^2y}{dx^2}+(4x-1)\frac{dy}{dx}+6x^2y=0$
d. $\frac{d^2y}{dx^2}+(4x-1)\frac{dy}{dx}+(1-2x^2)y=0$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b

2) The self-adjoint equation of the differential equation $x^2\frac{d^2y}{dx^2}-2x\frac{dy}{dx}+2y=0$ is *1 point*

HINT: The given differential equation is not a self adjoint equation. Transform it into an equivalent self adjoint equation.

a. $\frac{d}{dx}\left[\frac{1}{x^2}\frac{dy}{dx}\right]+\frac{2}{x^4}y=0$
b. $\frac{d}{dx}\left[\frac{1}{x^2}\frac{dy}{dx}\right]+\frac{1}{x}y=0$
c. $\frac{d}{dx}\left[\frac{1}{x}\frac{dy}{dx}\right]+\frac{1}{x^2}y=0$
d. $\frac{d}{dx}\left[x^2\frac{dy}{dx}\right]+\frac{2}{x^4}y=0$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a

3) The self-adjoint of the ODE $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+y=0$ is of the form $\frac{d}{dx}[p(x)y']+q(x)y=0$, then the values of $p(x)$ and $q(x)$ are *1 point*

a. $p(x)=x, q(x)=x$
b. $p(x)=\frac{1}{x}, q(x)=\frac{1}{x}$
c. $p(x)=x, q(x)=\frac{1}{x}$
d. $p(x)=\frac{1}{x}, q(x)=x$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
c

4) The orthonormal set of the orthogonal set of functions $\left\{\sin\left(\frac{n\pi x}{L}\right)\right\}, n=1,2,3,.....$ on the interval $(0,L)$ is given by *1 point*

a. $\left(\frac{2}{L}\right)\cos\left(\frac{n\pi x}{L}\right), n=1,2,3,....$
b. $\left(\frac{2}{L}\right)^{\frac{1}{2}}\cos\left(\frac{n\pi x}{L}\right), n=1,2,3,....$
c. $\left(\frac{2}{L}\right)\sin\left(\frac{n\pi x}{2L}\right), n=1,2,3,....$
d. $\left(\frac{2}{L}\right)^{\frac{1}{2}}\sin\left(\frac{n\pi x}{L}\right), n=1,2,3,....$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
d

5) The eigenvalue of the Sturm-Liouville problem $y''+\lambda y=0, 0\le x\le\pi; y(0)=0, y'(\pi)=0$ are *1 point*

a. $\frac{(n-1)^2}{2}$
b. $\frac{(2n-1)^2\pi^2}{4}$
c. $\frac{n^2\pi^2}{4}$
d. $\frac{(2n-1)^2}{4}$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
d

6) The eigenvalues for the boundary value problem $y''+\lambda y=0, 0\le x\le\pi; y(0)=0, y(\pi)+y'(\pi)=0$ satisfy *1 point*

a. $\sqrt{\lambda}+\tan(\pi\lambda)$
b. $\lambda+\tan(\pi\sqrt{\lambda})$
c. $\sqrt{\lambda}+\tan(\pi\sqrt{\lambda})$
d. $\lambda+\tan(\pi\lambda)$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
c

7) The eigen values of the Sturm-Liouville problem $\frac{d}{dx}[xy']+\frac{\lambda}{x}y=0, y'(1)=0, y(b)=0 (b>1)$ are given by *1 point*

a. $\frac{2n\pi}{\log b}$
b. $\frac{(2n-1)\pi}{2\log b}$
c. $\frac{(2n-1)}{\log b}$
d. $\frac{n\pi}{2\log b}$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b

8) The eigenfunctions of the Sturm-Liouville problem $y''+\lambda y=0(\lambda>0)$ with $y(0)=0$ an $y'(L)=0$ is equal to *1 point*

a. $\sin\left(\frac{(2n-1)\pi}{2L}x\right)$
b. $\cos\left(\frac{(2n-1)\pi}{2L}x\right)$
c. $\sin\left(\frac{n\pi}{2L}x\right)$
d. $\cos\left(\frac{n\pi}{2L}x\right)$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a

9) The eigenfunctions of the Sturm-Liouville problem $4y''-4y'+(1+\lambda)y=0$ with $y(0)=0, y(1)=0$ is equal to *1 point*

a. $e^{\frac{x}{2}}\cos(n\pi x)$
b. $e^{-\frac{x}{2}}\sin(n\pi x)$
c. $e^{\frac{x}{2}}\sin(n\pi x)$
d. $e^{-\frac{x}{2}}\cos(n\pi x)$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
c

10) The Eigen vectors of the Sturm-Liouville problem $y''+\lambda^2y=0; 0<x<\pi$ with $y'(0)=y'(\pi)=0$ are *1 point*

a. $\sin(nx)$
b. $\cos(nx)$
c. $\sin\left(n+\frac{1}{2}\right)x$
d. $\cos\left(n+\frac{1}{2}\right)x$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b

11) The eigenvalues and eigen functions of the Sturm-Liouville problem $\frac{d}{dx}(xy')+\frac{\lambda}{x}y=0$ with $y'(1)=0=y'(e^{2\pi})$ are *1 point*

a. $y(x)=1$ for $\lambda=0$ and $y_n(x)=\cos\left(\sqrt{n}\log x\right)$ for $\lambda_n=n, n=1,2,3,....$
b. $y(x)=1$ for $\lambda=0$ and $y_n(x)=\cos(n\log x)$ for $\lambda_n=n^2, n=1,2,3,....$
c. $y(x)=1$ for $\lambda=0$ and $y_n(x)=\sin\left(\frac{n}{2}\log x\right)$ for $\lambda_n=\frac{n^2}{4}, n=1,2,3,....$
d. $y(x)=1$ for $\lambda=0$ and $y_n(x)=\cos\left(\frac{n}{2}\log x\right)$ for $\lambda_n=\frac{n^2}{4}, n=1,2,3,....$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
d

12) The eigen functions of $\frac{d}{dx}\left(x^3y'\right)+\lambda xy=0(\lambda>1), y(1)=0=y(e)$ are *1 point*

a. $\frac{1}{x}\sin(n\pi\log x), n=1,2,3,....$
b. $\frac{1}{x}\sin(n\log x), n=1,2,3,....$
c. $\sin(n\pi\log x), n=1,2,3,....$
d. $x\sin(n\pi\log x), n=1,2,3,....$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a

13) The eigenvalues and eigen functions of the Sturm-Lioville problem $y''+\lambda y=0$ with $y(0)+y'(0)=0$ and $y(1)+y'(1)=0$ are *1 point*

a. $y(x)=e^{-x}$ for $\lambda=-1$ and $y_n(x)=\sin(n\pi x)-\cos(n\pi x)$ for $\lambda_n=n\pi, n=1,2,...$
b. $y(x)=e^{-x}$ for $\lambda=-1$ and $y_n(x)=\sin(n\pi x)-n\pi\cos(n\pi x)$ for $\lambda_n=n^2\pi^2, n=1,2,..$
c. $y(x)=e^{-x}$ for $\lambda=-1$ and $y_n(x)=\cos(n\pi x)-n\pi\sin(n\pi x)$ for $\lambda_n=n^2\pi^2, n=1,2,..$
d. $y(x)=e^{-x}$ for $\lambda=-1$ and $y_n(x)=\cos(n\pi x)-\sin(n\pi x)$ for $\lambda_n=n\pi, n=1,2,3,....$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b

14) The solution of the non-homogeneous Sturm-Liouville problem $-y''=x; 0<x<\pi$ with $y(0)=y(\pi)=0$ is *1 point*

a. $2\sum_{n=1}^{\infty}\frac{(-1)^{n+1}}{n^3}\sin(nx)$
b. $\sum_{n=1}^{\infty}\frac{(-1)^{n+1}}{n^3}\sin(nx)$
c. $2\sum_{n=1}^{\infty}\frac{(-1)^{n+1}}{n^3}\cos(nx)$
d. $2\sum_{n=1}^{\infty}\frac{1}{n^3}\sin(nx)$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a

15) The solution of the non-homogeneous Sturm-Liouville problem $-y''=x; 0<x<1$ with $y(0)=y(1)=0$ is *1 point*

a. $\sum_{n=1}^{\infty}\frac{1}{n^3\pi^3}\sin(n\pi x)$
b. $2\sum_{n=1}^{\infty}\frac{(-1)^{n+1}}{n^3\pi^3}\sin(n\pi x)$
c. $\sum_{n=1}^{\infty}\frac{1}{n^2\pi^2}\sin(n\pi x)$
d. $2\sum_{n=1}^{\infty}\frac{(-1)^{n}}{n^3\pi^3}\cos(n\pi x)$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b