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Courses » Integral Equations,calculus of variations and its applications

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Unit 5 - Week 4

Assignment 4

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

Due on 2018-09-05, 23:59 IST.

1) *A Green function for the BVP* **1 point**

$$\frac{d}{dx}\left((1-x^2)\frac{dy}{dx}\right)=0,\ y(0)=0,\ \text{y}(1)\text{ is finite, } \textit{is given by}$$

$$G(x,\xi)=\begin{cases}\frac{1}{2}\ln\frac{1-x}{1+x}, & 0\le x\le\xi;\\ \frac{1}{2}\ln\frac{1-\xi}{1+\xi}, & \xi\le x\le 1.\end{cases}$$

$$G(x,\xi)=\begin{cases}x\ln\frac{1-\xi}{1+\xi}, & 0\le x\le\xi;\\ (x-1)\ln\frac{1-\xi}{1+\xi}, & \xi\le x\le 1.\end{cases}$$

$$G(x,\xi)=\begin{cases}\ln\frac{1+x}{1-x}, & 0\le x\le\xi;\\ \ln\frac{1+\xi}{1-\xi}, & \xi\le x\le 1.\end{cases}$$

None of these.

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$G(x,\xi)=\begin{cases}\frac{1}{2}\ln\frac{1-x}{1+x}, & 0\le x\le\xi;\\ \frac{1}{2}\ln\frac{1-\xi}{1+\xi}, & \xi\le x\le 1.\end{cases}$$

2) *Consider the following IVP* $y'(x)=f(x),\ x\ge 0,\ y(0)=0.$ **1 point**

Then Green function $G(\xi,x)$ *for this IVP*

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$is\ H(\xi - x) + 2.$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$exists\ but\ not\ continuous$

3) $A\ Green\ function\ for\ the\ BVP$ **1 point**

$xy'' + y' = 0,\ y(l) = 0,$ y(0) is bounded,
$is\ given\ by$

$$G(x,\xi) = \begin{cases} x\ln\frac{\xi}{l}, & 0 \le x \le \xi; \\ \xi\ln\frac{x}{l}, & \xi \le x \le l. \end{cases}$$

$$G(x,\xi) = \begin{cases} x\ln\xi l, & 0 \le x \le \xi; \\ \xi\ln xl, & \xi \le x \le l. \end{cases}$$

$$G(x,\xi) = \begin{cases} \ln\frac{\xi}{l}, & 0 \le x \le \xi; \\ \ln\frac{x}{l}, & \xi \le x \le l. \end{cases}$$

$$G(x,\xi) = \begin{cases} \frac{1}{2}\ln\xi l, & 0 \le x \le \xi; \\ \frac{1}{2}\ln xl, & \xi \le x \le l. \end{cases}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$G(x,\xi) = \begin{cases} \ln\frac{\xi}{l}, & 0 \le x \le \xi; \\ \ln\frac{x}{l}, & \xi \le x \le l. \end{cases}$$

4) $A\ Green\ function\ for\ the\ BVP$ **1 point**

$y^{iv} = 0,\ y(0) = y'(0) = y''(1) = y'''(1) = 0\ is\ given\ by$

$$G(x,\xi) = \begin{cases} x^2(3\xi - x), & 0 \le x \le \xi; \\ \xi^2(3x - \xi), & \xi \le x \le 1. \end{cases}$$

$$G(x,\xi) = \begin{cases} x(3\xi - x)^2, & 0 \le x \le \xi; \\ \xi(3x - \xi)^2, & \xi \le x \le 1. \end{cases}$$

$$G(x,\xi) = \begin{cases} \frac{x^2}{6}(3\xi - x), & 0 \le x \le \xi; \\ \frac{\xi^2}{6}(3x - \xi), & \xi \le x \le 1. \end{cases}$$

$None\ of\ these$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$G(x,\xi) = \begin{cases} \frac{x^2}{6}(3\xi - x), & 0 \le x \le \xi; \\ \frac{\xi^2}{6}(3x - \xi), & \xi \le x \le 1. \end{cases}$$

5) $Using\ Green\ function\ the\ solution\ of\ the\ BVP$ **0 points**

$y^{iv} = 1,\ y(0) = y'(0) = y''(1) = y'''(1) = 0\ is\ given\ by$

- $y(x) = \frac{x^2}{24}\,(x^2 - 4x - 6)$
- $y(x) = x^2(\frac{x^2}{24} - 4x + 6)$
- $y(x) = \frac{x^2}{24}\,(x^2 + 2x - 6)$
- $y(x) = x^2(\frac{x^2}{24} + 4x - 6).$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$y(x) = \frac{x^2}{24}\,(x^2 - 4x - 6)$

6) **1 point**

$The\ integral\ equation\ corresponding\ to\ the\ BVP\ xy'' + y' = x + \lambda y,\ y(1) = y(e) = ($

$y(x) = f(x) + \lambda \int_1^e G(x,\xi)y(\xi)d\xi,\ where\ f(x)\ is\ given\ by$

- $f(x) = \frac{1}{4}\,(e^2 \ln x + x^2 - 1)$
- $f(x) = \frac{1}{4}\,[(1 - e^2)\ln x + 1 - x^2)]$
- $f(x) = \frac{1}{4}\,[(e^2 - 1)\ln x + 1 - x^2)]$
- $f(x) = \frac{1}{4}\,[(1 - e^2)\ln x + x^2 - 1)].$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$f(x) = \frac{1}{4}\,[(1 - e^2)\ln x + x^2 - 1)].$

7) **1 point**

$If\ the\ associated\ integral\ equation\ for\ the\ BVP\ y'' = \lambda y + e^x,\ y(0) = y(1) = 0\ i$

$s\ given\ by\ y(x) = \lambda \int_0^1 G(x,\xi)y(t)dt + f(x),\ then\ f(x)\ is\ given\ by$

- $f(x) = e^x + ex - x - 1$
- $f(x) = e^x - ex + x - 1$
- $f(x) = e^x + ex + x + 1$
- $f(x) = e^x - ex - x - 1$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$f(x) = e^x - ex + x - 1$

8) $Consider\ the\ Fredholm\ integral\ equation\ y(x) = \lambda\int_0^{\pi}\cos x\cos t y(t)dt.$ *1 point*

$The\ root\ of\ D_3(1),\ the\ resolvent\ determinant\ of\ size\ 3\times 3\ is$

- $f(x) = \frac{1}{\pi}$
- $f(x) = \frac{4}{\pi}$
- $f(x) = \frac{\pi}{2}$
- $f(x) = \frac{2}{\pi}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$f(x) = \frac{2}{\pi}$

9) *1 point*

$Consider\ the\ Fredholm\ integral\ equation\ y(x) = f(x) + \lambda\int_0^{2\pi}(\sin x - \sin t)y(t)dt.$

$Using\ Fredholm\ alternative,\ the\ resolving\ kernel\ \Gamma(x,t;\lambda)\ is\ given\ by$

- $\frac{(\sin x - \sin t) + \lambda\pi(1 + 2\sin x\sin t)}{1 + 4\pi^2\lambda^2}$
- $\frac{(\sin x - \sin t) - \lambda\pi(1 + 2\cos x\cos t)}{1 + 2\pi^2\lambda^2}$
- $\frac{(\sin x - \sin t) - \lambda\pi(1 + 2\sin x\sin t)}{1 + 2\pi^2\lambda^2}$
- $None\ of\ these.$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\frac{(\sin x - \sin t) - \lambda\pi(1 + 2\sin x\sin t)}{1 + 2\pi^2\lambda^2}$

10) *1 point*

$Consider\ the\ Fredholm\ integral\ equation\ y(x) = f(x) + \lambda\int_{-1}^{1}(x + t + 1)y(t)dt. Usir$

$Fredholm\ alternative,\ the\ resolving\ kernel\ \Gamma(x,t;\lambda)\ is$

- $\frac{(x+t+1) - 2\lambda(3xt+1)}{3 + 6\lambda - 4\lambda^2}$
- $\frac{3(x+t+1) - 2\lambda(3xt+1)}{3 - 6\lambda + 4\lambda^2}$
- $\frac{3(x+t+1) + 2\lambda(3xt+1)}{3 - 6\lambda - 4\lambda^2}$
- $None\ of\ these.$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\frac{3(x+t+1)+2\lambda(3xt+1)}{3-6\lambda-4\lambda^2}$$

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