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Courses » Integral Equations, calculus of variations and its applications

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## Unit 12 - Week 11

### Course outline

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Week 11

Invariance of Euler's equation and isoperimetric problem-I

Isoperimetric problem-II

Variational problem involving a conditional

### Assignment 11

The due date for submitting this assignment has passed. **Due on 2018-10-17, 23:59 IST.**  
As per our records you have not submitted this assignment.

1) The shortest distance from the point  $(-1, 5)$  to the parabola  $y^2 = x$  is **1 point**

$\sqrt{5}$

2

$2\sqrt{5}$

$2\sqrt{2}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$2\sqrt{5}$

2) **1 point**

The shortest distance between the circle  $x^2 + y^2 = 1$  and the straight line  $x + y = 4$

$2\sqrt{2}$

$2\sqrt{2} + 1$

3

$2\sqrt{2} - 1$

No, the answer is incorrect.

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Quiz :  
Assignment 11

Solutions of  
assignment-11

Week 12

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$r = a \sec(\theta \sin \alpha + b)$ ;  $a$  and  $b$  are arbitrary constants



$r = a \cos(\theta \sin \alpha + b)$ ;  $a$  and  $b$  are arbitrary constants



$r = a \sec(\theta \cos \alpha + b)$ ;  $a$  and  $b$  are arbitrary constants



None of these.

No, the answer is incorrect.

Score: 0

Accepted Answers:

$r = a \sec(\theta \sin \alpha + b)$ ;  $a$  and  $b$  are arbitrary constants

4) The extremal of the functional

1 point

$$I[y(x)] = \int_0^{\frac{\pi}{2}} (y'^2 - y^2 + 4y \sin^2 x) dx; y(0) = y\left(\frac{\pi}{2}\right) = \frac{1}{3}$$

is given by



$$y(x) = \frac{\sin x + \cos x}{3}$$



$$y(x) = \frac{2 \sin x + \cos 2x}{3}$$



$$y(x) = \frac{-2 \sin x - \cos 2x + 2}{3}$$



None of these.

No, the answer is incorrect.

Score: 0

Accepted Answers:

None of these.

5) The extremal of the functional

1 point

$$I[y(x)] = \int_0^2 y'^2 dx; y(0) = 0, y(2) = 1$$

and subjected to the condition  $\int_0^2 y dx = 1$  is given by



$$y(x) = \frac{x}{2}$$



$$y(x) = \frac{x(x+2)}{8}$$



$$y(x) = \sin \pi x$$



None of these.

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$y(x) = \frac{x}{2}$$

6)

1 point

The extremal of the functional

$$I[y(x)] = \int_0^1 (x^2 + y'^2) dx; y(0) = 0, y(1) = 0$$

and subjected to the condition  $\int_0^1 y^2 dx = 2$  is given by

$$y(x) = \sin m\pi x; m \in \mathbb{Z}$$

$$y(x) = \cos m\pi x; m \in \mathbb{Z}$$

$$y(x) = \sin 2m\pi x; m \in \mathbb{Z}$$

None of these.

No, the answer is incorrect.

Score: 0

Accepted Answers:

None of these.

7) The solid figure of revolution of given volume, which passes through origin and extremizes its surface is **1 point**

Cylinder

Sphere

Cone

None of these.

No, the answer is incorrect.

Score: 0

Accepted Answers:

Sphere

8) **1 point**

The extremal of the functional  $I[y(x)] = \int_0^a \pi y^2 dx; y(0) = 0, y(a) = 0$ , and subject to the condition  $\int_0^a 2\pi y \sqrt{1 + y'^2} dx = \text{constant}$  is given by

$$y^2 + x^2 = \alpha^2$$

$$(y - \alpha)^2 + x^2 = \alpha^2$$

$$(x - \alpha)^2 + y^2 = \alpha^2$$

None of these.

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$(x - \alpha)^2 + y^2 = \alpha^2$$

9)

**1 point**

The differential equation for the extremal of the iso - perimetric problem  $I[y(x)] = \int_0^a (x^2 y'^2 + y^2) dx$  with boundary conditions  $y(0) = 0 = y(a)$  and subjected to the condition  $\int_0^a x^2 y^2 dx = 1$ , is ( $\lambda$  being a constant)

$x^2 y'' + xy' + (\lambda x^2 - 1)y = 0$

$x^2 y'' + 2xy' + (\lambda x - 1)y = 0$

$x^2 y'' + 2xy' - (\lambda x^2 + 1)y = 0$

None of these.

No, the answer is incorrect.

Score: 0

Accepted Answers:

$x^2 y'' + 2xy' - (\lambda x^2 + 1)y = 0$

10)

1 point

Extremal of the functional  $I[y(x)] = \int_a^b (y\sqrt{1+y'^2}) dx$ ;  $y(a) = y_1$ ,  $y(b) = y_2$  and subjected to the condition  $\int_a^b \sqrt{1+y'^2} dx = l$  is ( $c_1$ ,  $c_2$  and  $\lambda$  are suitable constants)

$y(x) + \lambda = c_1 \cosh \frac{x-c_2}{c_1}$

$y(x) + \lambda = c_1 \sinh \frac{x-c_2}{c_1}$

$y(x) = \lambda c_1 \sinh(x - c_1)$

None of these.

No, the answer is incorrect.

Score: 0

Accepted Answers:

$y(x) + \lambda = c_1 \cosh \frac{x-c_2}{c_1}$

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