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Unit 13 - Week 12

Course outline

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- Variational problems with moving boundaries-II
- Variational problems with moving boundaries-III
- Variational problems with moving boundaries; One sided variation
- Variational problem with a movable boundary for a functional dependent on two functions
- Hamilton's principle: Variational principle of least action
- Quiz : Assignment 12
- New Lesson
- solution of week 12

WEEKLY FEEDBACK

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Assignment 12

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

Due on 2018-10-24, 23:59 IST.

1) The shortest distance between the parabola $y = x^2$ and the straight line $y = x - 5$ is

1 point

$$\frac{19}{8}$$

$$\frac{19\sqrt{2}}{8}$$

$$\frac{9\sqrt{2}}{8}$$

$$\frac{9\sqrt{3}}{8}$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\frac{19\sqrt{2}}{8}$$

2) The shortest distance of an interior point $(1, 1)$ from the circle $(x - 2)^2 + y^2 = 9$, is

1 point

$$3 - \sqrt{2}$$

$$3 + \sqrt{2}$$

$$2 + \sqrt{3}$$

$$2 - \sqrt{3}$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$3 - \sqrt{2}$$

3)

The curve along which the shortest distance between the parabola $y^2 = 4x$ and the line $x + y + 5 = 0$ occurs, is

1 point

$$y = x - 3$$

$$y = x + 3$$

$$y = x$$

$$y = x - 1$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$y = x - 3$$

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$$y = x + 1$$



$$y = 2(x - 1)$$



$$y = 2x - 1$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$y = 2(x - 1)$$

5) The curves on which an extremum $I[y] = \int_0^{10} y^3 dx$, $y(0) = 0$, $y(10) = 0$

1 point

can be achieved provided that the permissible curves can not pass inside the area bounded by the circle $(x - 5)^2 + y^2 = 9$, are given by



$$\begin{cases} \pm \frac{3}{4}x, & \text{for } 0 \leq x \leq \frac{16}{5} \\ \pm \sqrt{9 - (x - 5)^2}, & \text{for } \frac{16}{5} < x \leq \frac{34}{5} \\ \pm \frac{1}{4}(x - 10), & \text{for } \frac{34}{5} < x \leq 10 \end{cases}$$



$$\begin{cases} \pm \frac{1}{4}x, & \text{for } 0 \leq x \leq \frac{16}{5} \\ \pm \sqrt{9 - (x - 5)^2}, & \text{for } \frac{16}{5} < x \leq \frac{34}{5} \\ \pm \frac{3}{4}(x - 10), & \text{for } \frac{34}{5} < x \leq 10 \end{cases}$$



$$\begin{cases} \pm \frac{3}{4}x, & \text{for } 0 \leq x \leq \frac{16}{5} \\ \pm \sqrt{9 - (x - 5)^2}, & \text{for } \frac{16}{5} < x \leq \frac{34}{5} \\ \pm \frac{3}{4}(x - 10), & \text{for } \frac{34}{5} < x \leq 10 \end{cases}$$



$$\begin{cases} \pm \frac{1}{4}x, & \text{for } 0 \leq x \leq \frac{16}{5} \\ \pm \sqrt{9 - (x - 5)^2}, & \text{for } \frac{16}{5} < x \leq \frac{34}{5} \\ \pm \frac{1}{4}(x - 10), & \text{for } \frac{34}{5} < x \leq 10 \end{cases}$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\begin{cases} \pm \frac{3}{4}x, & \text{for } 0 \leq x \leq \frac{16}{5} \\ \pm \sqrt{9 - (x - 5)^2}, & \text{for } \frac{16}{5} < x \leq \frac{34}{5} \\ \pm \frac{3}{4}(x - 10), & \text{for } \frac{34}{5} < x \leq 10 \end{cases}$$

6) The extremal of the shortest distance between two fixed points $(2, 2)$ and $(2, -2)$ located in the region $y^2 \geq x$, is

1 point



$$x = \begin{cases} -y(4 - 2\sqrt{2}) - (6 - 4\sqrt{2}), & -2 \leq y \leq -2 + \sqrt{2} \\ y^2, & -2 + \sqrt{2} \leq y \leq 2 - \sqrt{2} \\ y(4 - 2\sqrt{2}) - (6 - 4\sqrt{2}), & 2 - \sqrt{2} \leq y \leq 2 \end{cases}$$



$$x = \begin{cases} -y(2 - \sqrt{2}) - (3 - 2\sqrt{2}), & -2 \leq y \leq -2 + \sqrt{2} \\ y^2, & -2 + \sqrt{2} \leq y \leq 2 - \sqrt{2} \\ y(2 - \sqrt{2}) - (3 - 2\sqrt{2}), & 2 - \sqrt{2} \leq y \leq 2 \end{cases}$$



$$x = \begin{cases} -y(2 + \sqrt{2}) - (3 + 2\sqrt{2}), & -2 \leq y \leq -2 + \sqrt{2} \\ y^2, & -2 + \sqrt{2} \leq y \leq 2 - \sqrt{2} \\ y(2 + \sqrt{2}) - (3 + 2\sqrt{2}), & 2 - \sqrt{2} \leq y \leq 2 \end{cases}$$



$$x = \begin{cases} -y(2 - \sqrt{2}) - (3 + 2\sqrt{2}), & -2 \leq y \leq -2 + \sqrt{2} \\ y^2, & -2 + \sqrt{2} \leq y \leq 2 - \sqrt{2} \\ y(2 - \sqrt{2}) - (3 + 2\sqrt{2}), & 2 - \sqrt{2} \leq y \leq 2 \end{cases}$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$x = \begin{cases} -y(4 - 2\sqrt{2}) - (6 - 4\sqrt{2}), & -2 \leq y \leq -2 + \sqrt{2} \\ y^2, & -2 + \sqrt{2} \leq y \leq 2 - \sqrt{2} \\ y(4 - 2\sqrt{2}) - (6 - 4\sqrt{2}), & 2 - \sqrt{2} \leq y \leq 2 \end{cases}$$

7)

1 point

The extremal of the functional $I[y(x), z(x)] = \int_{x_1}^{x_2} (y'z' + 2y'^2 + 2z'^2)dx$ with $y(0) = 0$, $z(0) = 0$

where the point (x_2, y_2, z_2) moves over the fixed plane $x = x_2$ and $\cos 2x_2 = 0$, is given by

$$y = c \sin x, z = -c \sin x$$

$$y = 0, z = 0$$

$$y = c \cos 2x, z = -c \cos 2x$$

$$y = c \sin 2x, z = -c \sin 2x$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$y = c \sin x, z = -c \sin x$$

8) The shortest distance from the point $(0, 2, 1)$ to the straight line

1 point

$$\frac{x}{1} = \frac{y}{2} = \frac{z}{3}, \text{ is}$$

$$\frac{\sqrt{6}}{2}$$

$$\frac{2\sqrt{6}}{3}$$

$$\frac{\sqrt{6}}{3}$$

$$\frac{3\sqrt{6}}{2}$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\frac{\sqrt{6}}{2}$$

9) Let T and V denote the Kinetic energy and potential energy of a particle in a force

1 point

field \vec{f} . If \vec{f} is conservative then

$$\vec{f} \cdot \delta \vec{r} = \delta V$$

$$\vec{f} \cdot \delta \vec{r} = -\delta V$$

$$\vec{f} \cdot \delta \vec{r} = \delta T$$

$$\vec{f} \cdot \delta \vec{r} = -\delta T$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\vec{f} \cdot \delta \vec{r} = -\delta V$$

10)

1 point

Let T and V be the Kinetic energy and potential energy of a particle. If the force field \vec{f} is conservative then the I principle takes the form

$$\delta \int_{t_1}^{t_2} (T - V) dt = 0$$

$$\delta \int_{t_1}^{t_2} (T + V) dt = 0$$

$$\int_{t_1}^{t_2} \left(\delta T + \vec{f} \cdot \delta \vec{r} \right) dt = 0$$

none of these

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\delta \int_{t_1}^{t_2} (T - V) dt = 0$$

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