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

- \( 19 \) [ ]
- \( 19/8 \) [ ]
- \( 19\sqrt{2} / 8 \) [ ]
- \( 9\sqrt{2} / 8 \) [ ]
- \( 9\sqrt{3} / 8 \) [ ]

No, the answer is incorrect.
Score: 0
Accepted Answers:
- \( 19\sqrt{2} / 8 \)

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

- \( 3 - \sqrt{2} \) [ ]
- \( 3 + \sqrt{2} \) [ ]
- \( 2 + \sqrt{3} \) [ ]
- \( 2 - \sqrt{3} \) [ ]

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

- \( y = x - 3 \) [ ]
- \( y = x + 3 \) [ ]
- \( y = x \) [ ]
- \( y = x - 1 \) [ ]

No, the answer is incorrect.
Score: 0
Accepted Answers:
- \( y = x - 3 \)
Integral Equations, calculus of variations and its...

No, the answer is incorrect.
Score: 0
Accepted Answers:
y = 2(x – 1)

9) The curves on which an extremum \( I[y] = \int_{0}^{10} y'^2 dx \), \( y(0) = 0, \ y(10) = 0 \) 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

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

No, the answer is incorrect.
Score: 0
Accepted Answers:
\[
\begin{aligned}
&\pm \frac{3}{5} x, & &\text{for } 0 \leq x \leq \frac{16}{5} \\
&\pm \sqrt{9 - (x - 5)^2}, & &\text{for } \frac{16}{5} < x \leq \frac{34}{5} \\
&\pm \frac{4}{5} (x - 10), & &\text{for } \frac{34}{5} < x \leq 10 \\
\end{aligned}
\]

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

\[
\begin{aligned}
x &= \begin{cases}
-y(4 - 2\sqrt{2}) - (6 - 4\sqrt{2}), & -2 \leq y \leq -2 + \sqrt{2} \\
y^2, & -2 + \sqrt{2} \leq y \leq 2 - \sqrt{2} \\
y(4 - 2\sqrt{2}) - (6 - 4\sqrt{2}), & 2 - \sqrt{2} \leq y \leq 2 \\
\end{cases} \\
x &= \begin{cases}
-y(2 - \sqrt{2}) - (3 - 2\sqrt{2}), & -2 \leq y \leq -2 + \sqrt{2} \\
y^2, & -2 + \sqrt{2} \leq y \leq 2 - \sqrt{2} \\
y(2 - \sqrt{2}) - (3 - 2\sqrt{2}), & 2 - \sqrt{2} \leq y \leq 2 \\
\end{cases} \\
x &= \begin{cases}
-y(2 + \sqrt{2}) - (3 + 2\sqrt{2}), & -2 \leq y \leq -2 + \sqrt{2} \\
y^2, & -2 + \sqrt{2} \leq y \leq 2 - \sqrt{2} \\
y(2 + \sqrt{2}) - (3 + 2\sqrt{2}), & 2 - \sqrt{2} \leq y \leq 2 \\
\end{cases} \\
x &= \begin{cases}
-y(2 - \sqrt{2}) - (3 + 2\sqrt{2}), & -2 \leq y \leq -2 + \sqrt{2} \\
y^2, & -2 + \sqrt{2} \leq y \leq 2 - \sqrt{2} \\
y(2 - \sqrt{2}) - (3 + 2\sqrt{2}), & 2 - \sqrt{2} \leq y \leq 2 \\
\end{cases}
\]

No, the answer is incorrect.
Score: 0
Accepted Answers:
\[
\begin{aligned}
x &= \begin{cases}
-y(4 - 2\sqrt{2}) - (6 - 4\sqrt{2}), & -2 \leq y \leq -2 + \sqrt{2} \\
y^2, & -2 + \sqrt{2} \leq y \leq 2 - \sqrt{2} \\
y(4 - 2\sqrt{2}) - (6 - 4\sqrt{2}), & 2 - \sqrt{2} \leq y \leq 2 \\
\end{cases} \\
\]

7)
The extremal of the functional \( I[y(x), z(x)] = \int_{x_1}^{x_2} (y' z' + 2y z' + 2z^2) dx \) with \( y(0) = 0, \ z(0) = 0 \)

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

\[
\begin{align*}
y &= \sin x, \ z = -\sin x \\
y &= 0, \ z = 0 \\
y &= \cos 2x, \ z = -\cos 2x \\
y &= \sin 2x, \ z = -\sin 2x
\end{align*}
\]

No, the answer is incorrect.

Accepted Answers:
\( y = \sin x, \ z = -\sin x \)

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

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

\[
\begin{align*}
\sqrt{2} \\
2\sqrt{3} \\
\sqrt{3} \\
\frac{3\sqrt{2}}{2}
\end{align*}
\]

No, the answer is incorrect.

Accepted Answers:
\( \frac{3\sqrt{2}}{2} \)

9) Let \( T \) and \( V \) denote the Kinetic energy and potential energy of a particle in a force 1 point

field \( \mathbf{f} \). If \( \mathbf{f} \) is conservative then

\[
\begin{align*}
\mathbf{f} \cdot \delta \mathbf{r} &= \delta V \\
\mathbf{f} \cdot \delta \mathbf{r} &= -\delta V \\
\mathbf{f} \cdot \delta \mathbf{r} &= \delta T \\
\mathbf{f} \cdot \delta \mathbf{r} &= -\delta T
\end{align*}
\]

No, the answer is incorrect.

Accepted Answers:
\( \mathbf{f} \cdot \delta \mathbf{r} = -\delta V \)

10) Let \( T \) and \( V \) be the Kinetic energy and potential energy of a particle. If the force field \( \mathbf{f} \) is conservative then the I principle takes the form 1 point

\[
\begin{align*}
\delta \int_{t_1}^{t_2} (T - V) dt &= 0 \\
\delta \int_{t_1}^{t_2} (T + V) dt &= 0 \\
\int_{t_1}^{t_2} \left( \delta T + \mathbf{f} \cdot \delta \mathbf{r} \right) dt &= 0
\end{align*}
\]

none of these

No, the answer is incorrect.

Score: 0
\[ \delta \int_{t_1}^{t_2} (T - V) \, dt = 0 \]