Assignment-10

The due date for submitting this assignment has passed. **Due on 2021-03-31, 23:59 IST.**

As per our records you have not submitted this assignment.

1. We use $B(\cdot, \cdot)$ and $\overline{B}(\cdot, \cdot)$ to denote balls in $\mathbb{R}^2$ and $\mathbb{R}^3$ respectively. Let $g : \mathbb{R}^2 \to \mathbb{R}$ be a continuous function. Define, for $x = (x_1, x_2) \in \mathbb{R}^2$, $\overline{x} = (x_1, x_2, 0) \in \mathbb{R}^3$; $r(y) := \sqrt{y^2 + (y - x_1)^2}$, $y \in B(x, r)$ and $\overline{r}(x_1, x_2, 0) := g(x_1, x_2)$. Let $\delta B$ denote the 2-dimensional surface measure on $\partial B(x, r)$. Then $\int_{\partial B(x, r)} g(y) \, \delta B(y) = 1 \text{ point} \tag{1}$

\[
\frac{1}{4\pi} \int_{B(x_1, x_2)} g(y) (\sqrt{y^2})^\frac{3}{2} \, dy. \\
\frac{1}{4\pi} \int_{B(x_1, x_2)} g(y) (1 + (\sqrt{y^2})^\frac{3}{2}) \, dy. \\
2 \int_{B(x_1, x_2)} g(y) (1 + (\sqrt{y^2})^\frac{3}{2}) \, dy.
\]

None of the above.

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{1}{4\pi} \int_{B(x_1, x_2)} g(y) (1 + (\sqrt{y^2})^\frac{3}{2}) \, dy.$

2. Solution to the problem $u_t = \Delta u = f$, $(x, t) \in \mathbb{R}^3 \times (0, \infty)$; $u = u_0 = 0$ on $\partial \mathbb{R}^3 \times (0)$ is 1 point

\[
u(x, t) = \int_{\mathbb{R}^3} f(y) \frac{d(x-y)}{|y|} \, dy. \\
u(x, t) = \frac{1}{4\pi} \int_{\mathbb{R}^3} f(y) \frac{d(x-y)}{|y|} \, dy. \\
\]

None of the above.

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\int_{\mathbb{R}^3} f(y) \frac{d(x-y)}{|y|} \, dy.$

3. If $u$ solves $u_{tt} - \Delta u = 0$, $(x, t) \in \mathbb{R}^3 \times (0, \infty)$; $u = g, u_t = h$ on $\partial \mathbb{R}^3 \times (0)$, where $g$ and $h$ have compact supports, 1 point

\[
u(x, t) \leq C. \\
u(x, t) \geq C. \\
u(x, t) = C.
\]

None of the above.

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\nu(x, t) \leq C.$

4. If $u$ solves $u_{tt} - \Delta u + m^2 u = 0$, $(x, t) \in \mathbb{R}^3 \times (0, \infty)$; $u = g, u_t = h$ on $\partial \mathbb{R}^3 \times (0)$, define $E(t) := \frac{1}{2} \int_{\mathbb{R}^3} (u_t^2 + |Vu|^2 + m^2 u^2) \, dx$, $t \geq 0$. Then $E$, in its domain, is

\[
\text{discontinuous.} \\
\text{strictly increasing everywhere.} \\
E(0) \leq E(1). \\
E(0) \leq E(1). \\
\text{constant everywhere.}
\]

No, the answer is incorrect.
Score: 0
Accepted Answers:
$E(0) \leq E(1).$ 

constant everywhere.