

Evaluate by changing order of integration.

$$\int_{y}^{4} \frac{x}{x^2 + y^2} \, dy \, dx$$

c)

0

b)

Evaluate $\int_{0}^{2} \int_{0}^{\sqrt{2x-x^2}} \frac{x}{\sqrt{x^2+y^2}} dy dx$ by changing into polar coordinates.

OR

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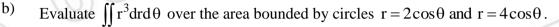
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6. a) Evaluate $\int_{-1}^{1} \int_{0}^{z} \int_{x-z}^{x+z} (x+y+z) dy dx dz$



Find the area lying between the parabola $y = 4x - x^2$ and the line y = x.

7. a) Prove that

c)

8.

- i) $\left[\overline{b} \overline{c} \ \overline{c} \overline{a} \ \overline{a} \overline{b}\right] = 0$
- ii) $(\overline{b} \times \overline{c}) \cdot \{(\overline{c} \times \overline{a}) \times (\overline{a} \times \overline{b})\} = \{(\overline{a} \times \overline{b}) \cdot c\}^2$
- b) A particle moves along a curve $x = t^3 + 1$, $y = t^2$, z = 2t + 5, where t is the time. Find the component of its velocity and acceleration at t = 1 in the direction i + j + 3k.

c) Find the angle between the tangents to the curve $\bar{r} = t^2 i - 2tj + t^3 k$ at the points t = 1 and t = 2.

OR

a) Find the directional derivative of $\phi = x^2 - y^2 + 2z^2$ at the point P(1, 2, 3) in the direction of line PQ where Q is the point (5, 0, 4). In what direction will it be maximum.

b) A vector field is given by - $\overline{A} = (x^2 + xy^2)i + (y^2 + x^2y)j$ Show that field is irrotational and find its scalar potential.

c) If $\bar{r} = xi + yj + zk$ show that

grad $r = \frac{r}{r}$

ii) $\nabla r^n = n r^{n-2} \overrightarrow{r}$

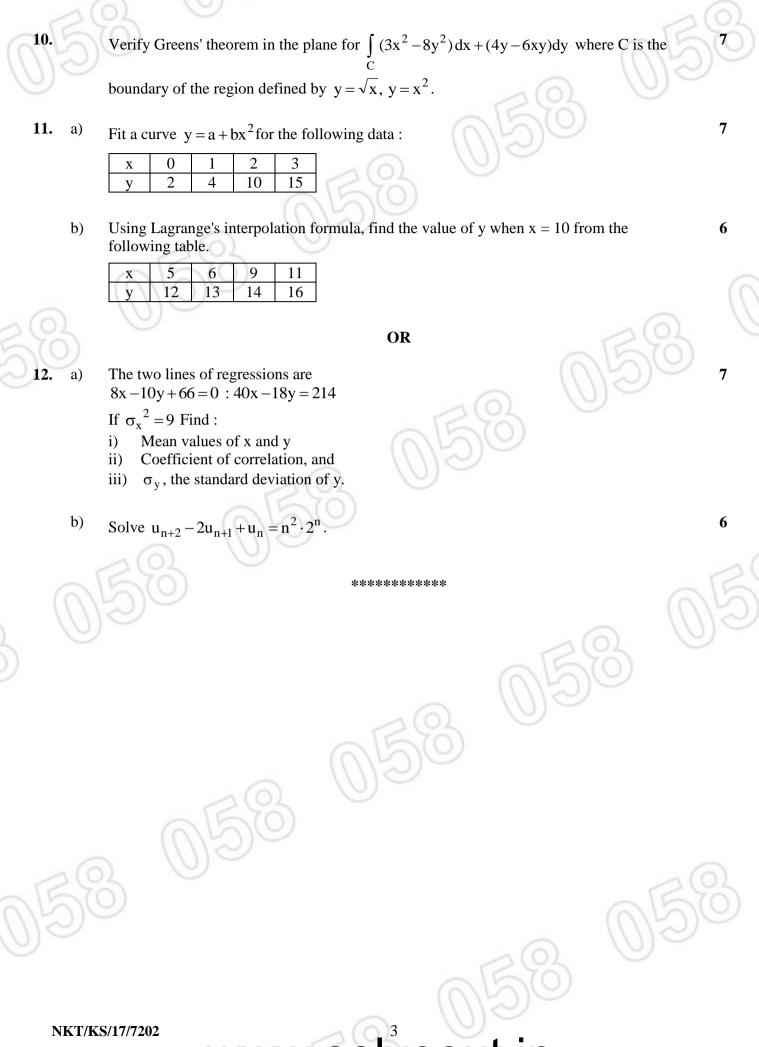
Find the total work done in moving a particle in a field of force given by $\overline{F} = 3xyi - 5zj + 10xk$ along the curve $x = t^2 + 1$, $y = 2t^2$, $z = t^3$ from t = 1 to t = 2.

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i)

OR

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