Assignment

1. Solve the following boundary value problem:
$$\frac{\partial u}{\partial t} = \alpha^2 \frac{\partial^2 u}{\partial x^2}, 0 < x < l, \qquad \frac{\partial u(0,t)}{\partial x} = 0, \frac{\partial u(l,t)}{\partial x} = 0, u(x,0) = x$$
2. A square plate is bounded by the lines $x = 0, y = 0, x = 20$ and $y = 20$. Its faces are insulated. The temperature along the upper horizontal edge is given by
$u(x, 20) = x(20 - x), when\ 0 < x < 20,$
while other three edges are kept at $0^0\ C.$ Find the steady state temperature in the plate.
3. Find the length of the following curve $\overrightarrow{r(t)} = a\cos^3 t\ \hat{\imath} + a\sin^3 t\,\hat{\jmath}\ , 0 \leq t \leq \frac{\pi}{2}$ (one cusp of hypocycloid).
4. Find the directional derivative of the given scalar function at the given point in the indicated direction, $2x^2 + y^2 + z^2$, (1,2,3), in the direction of the line $\frac{x}{3} = \frac{y}{4} = \frac{z}{5}$.
5. Find the angle between the two surfaces at the indicated point of intersection
$z = x^2 + y^2, z = 2x^2 - 3y^2, (2, 1, 5).$
6. Find a scalar function f such that $\vec{v} = \nabla f$.
$\vec{v} = e^{xyz}(yz\hat{\imath} + xz\hat{\jmath} + xy\hat{k})$

Note: Dear All,

1. Solve the assignment and upload pdf copy in the UMS before 20 April 2020.
2. Mention your roll number on every sheet before.
3. You are required to submit the hard copy to me later on.
4. In case of copy case your will be given zero marks.