Engineering Mathematics II MAT 1251

First sessional - 14.02.2019

I

1. The value of $\lim_{x\to 0} \frac{(1+x)^{1/x}-e}{e}$ is
   a) e
   b) **0**
   c) 1
   d) $\frac{1}{3}$
2. Change the order of integration in $\int_0^4 \int_0^{4-y}(x+y)dxdy$. Then the corresponding integral is
   a) $\int_0^3 \int_1^4 (x+y)dydx$
   b) $\boldsymbol{\int_0^4 \int_0^{4-x}(x+y)dydx}$
   c) $\int_0^4 \int_0^4 (x+y)dydx$
   d) $\int_0^3 \int_1^{4-x} (x+y)dydx$
3. Given $x^3+y^3-3axy=0$, then $\frac{dy}{dx}$ =
   a) $3x^2-3ay$
   b) $3y^2-3ax$
   c) $\boldsymbol{\frac{ay-x^2}{y^2-ax}}$
   d) $\frac{ay+x^2}{y^2+ax}$
4. $\lim_{x\to 0} \frac{3^x-2^x}{x}$ =
   a) $\boldsymbol{log\left(\frac{3}{2}\right)}$

$b)\ log\left(\frac{2}{3}\right)$

$c)\ 0$

$d)\ 1$

5. If functions x^2 and x satisfy the Cauchy mean value theorem in $[a, b]$, where $a, b > 0$ then the value of c is
   a) ab
   b) $2ab$

   c) $\frac{(a+b)}{2}$

   d) $\frac{(a+b)}{4}$

6. If $u = \sin^{-1}\frac{x}{y} + \tan^{-1}\frac{y}{x}$ then evaluate $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} =$
   a) $2u$
   b) u
   c) $\frac{u}{2}$
   d) 0

7. If the percentage error in radius of a sphere is 0.3, then percentage error in volume of the sphere is
   a) 0.8

   b) 0.9

   c) 0.1

   d) 0.6

8. If $u = x^y - y^x$, then $\frac{\partial u}{\partial x} =$

   (a) $xy^{x-1} - x^y logx$

   (b) $\boldsymbol{yx^{y-1} - y^x logy}$

   (c) $x^y\ logx - xy^{x-1}$

(d) $yx^{y-1} - xy^{x-1}$

9. The Maclaurin's series expansion of $y = \log(secx)$ up to second degree terms is _____

(a) $\frac{x^2}{2}$

(b) $x + \frac{x^2}{3}$

(c) $1 + \frac{x^2}{2}$

(d) x^2

10. The stationary point of $f(x, y) = x^2 - xy + y^2 + 2x - 4y + 1$ is

a) $(0, 0)$

b) (0, 2)

c) (2, 2)

d) (2, 0)

II.

1. Evaluate $\iint_R e^{y^2}\, dxdy$, where R is the triangle formed by the vertices $(0, 0), (0, 1)$ and $(2, 1)$.

2. Change the order of integration and evaluate $\int_0^a \int_{\sqrt{ax}}^a \frac{y^2}{\sqrt{y^4 - a^2x^2}}\, dydx$.

3. Expand $f(x, y) = \tan^{-1}(\frac{y}{x})$ about (1,1) upto third degree terms.

4. If $u = \tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$, prove that

$$x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} = (1 - 4\sin^2 u)sin2u.$$

5. Find the maximum and minimum distances of the point (1,2,3) from the sphere $x^2 + y^2 + z^2 = 36$.