



Applied Mathematics II Final exam

Addis Ababa University
Department of Mathematics
Math 1042 (Applied mathematics II) Final Exam

Date: 11 June, 2018
Time Allowed: 2 $\frac{1}{2}$ hrs

Name: _____ ID. No. _____
Department: _____ Name of Instructor: _____

Part I: Ten short Answer questions. Write your answer in its simplified form on the space provided. Each question worth 1.5 points.

1. $\lim_{(x,y) \rightarrow (1,-1)} \frac{2y^2 + 2\sqrt{x}y - \sqrt{x}y^2 - xy}{\sqrt{x} + y} =$ _____
2. A normal vector to the graph of $f(x,y) = \sqrt{x^2y^2 + xy}$ at $(1,1,\sqrt{2})$ is _____
3. Consider the equation $z^3y^2 + \frac{z^2}{x} = 0$. Assuming that $z = f(x,y)$, the value of $\frac{\partial z}{\partial x}(1,1,-1)$ is _____
4. $\int_0^1 \int_x^1 \sqrt{9+y^2} dy dx =$ _____
5. The volume of the solid bounded by $z = x^2 + y^2$, $z = 0$ and $x^2 + (y-1)^2 = 1$ is _____
6. The density at each point (x,y) of the circular disk of radius 1 is $\delta(x,y) = \sqrt{x^2 + y^2}$, then the total mass of the disk is _____
7. The Jacobian of the transformation $x = uv$ and $y = \frac{u}{v}$ is _____
8. If the n^{th} partial sum of the series $\sum_{n=1}^{\infty} a_n$ is given by $s_n = \ln(4n+1) - \ln(2n+5)$, then the sum of the series is _____
9. The series $\sum_{n=1}^{\infty} \frac{2 \cdot 4^n}{5^n}$ converges to _____
10. The series $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n}{n^2+1}$ is absolutely convergent. (True/False/ Cannot be deteremined) _____

Part II: Five work out Problems. Show your steps clearly and neatly on the space provided.

1. Let $f(x, y) = x^2y - 2xy + 2y^2 - 15y$.
 - a) Find all the critical point(s) of f . (3 Points)
 - b) Determine the relative extreme and saddle point(s), if any, of f . (3 Points)

2. Find the surface area of the portion of the paraboloid $z = 9 - x^2 - y^2$ below the plane $z = 5$ and above the xy -plane. (5 Points)

3. Evaluate $\iiint_D xz \, dv$, where D is the solid region in the first octant bounded above by the sphere $x^2 + y^2 + z^2 = 4$, below by the plane $z = 0$, and on sides by the cylinder $x^2 + y^2 = 1$. (5 Points)

4. Using integral test check the convergence or divergence of the series $\sum_{n=1}^{\infty} ne^{-n^2}$. (3 Points)

5. Test for convergence or divergence

a) $\sum_{n=1}^{\infty} \frac{\pi^{n+1}}{3^n n^2}$

(3 Points)

b) $\sum (-1)^n \frac{2n^2 + 1}{n^3}$

(3 Points)



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