

Final Term Examination

Subject: Mathematic III

Code: CENG 203, MENG208, ELTE201, CONT201, COM201

Examiner: Dr. Fathi Abdessalam

Time Allowed: 2 hours

Number of Pages: 1

Number of Questions: 5

Attempt all Questions

Question 1, (8 Marks)

Find the first and the second partial derivative for $f(x, y) = (x^3 - y^2)^5$ (4 Marks)

(a) If $w = \ln(x^2 + y^2)$ Show that $x \frac{\partial w}{\partial x} + y \frac{\partial w}{\partial y} = 2$ (4 Marks)

Question 2, (8 Marks)

Solve the following differential equations

(a) $x \sqrt{1+y^2} dx + y \sqrt{1+x^2} dy = 0$ (4 Marks)

(b) $(xy - x^2)dy - y^2 dx = 0$ (4 Marks)

Question 3, (8 Marks)

Find the general solution for the following differential equations

(a) $(D^2 - 3D + 2)y = e^{3x}$ (4 Marks)

(b) $(D^2 + D - 2)y = \sin x$ (4 Marks)

Question 4, (8 Marks)

(a) Find $\nabla \cdot \vec{F}$ and $\nabla \times \vec{F}$ given that $\vec{F} = (2x^2y + z^2)\vec{i} + x^2\vec{j} + 3x^2z^3\vec{k}$ (4 Marks)

(b) Find $\oint \vec{F} \cdot d\vec{r}$ where $\vec{F} = (x - y)\vec{i} + (x + y)\vec{j}$
on the circle $x = 2\cos\theta, y = 2\sin\theta$ (4 Marks)

Question 5, (8 Marks)

(a) Evaluate $\int_C \frac{z^2 + 5}{z - 1} dz$ where C is the circle $z = 2e^{i\theta}$. (4 Marks)

(b) Use ratio test to test the series $\sum_{n=1}^{\infty} \frac{3n + 2}{5^n}$ for convergence. (4 Marks)