MINISTRY OF EDUCATION AND TRAINING
NATIONAL ECONOMICS UNIVERSITY

FALCULTY OF FUNDAMENTAL SCIENCES

FINAL EXAMINATION

Subject: Calculus 2

Mode of study: Full time **Intake:**

Exam place: **Exam date:**

Exam time: **Allowed time:** ***90 minutes***

Version: 01

Question 1: ***(1.5 points)*** Solve the initial value problem: $x\frac{dy}{dx} - y = x\ln x, y(1) = 2$.

Question 2: ***(1.5 points)*** Test the series $\sum_{n=1}^{\infty}\frac{(-1)^n(n+1)3^n}{2^{2n+1}}$ for absolute convergence, conditional convergence or divergent. Explain what test you are applying and how you apply them.

Question 3: ***(1.0 point)*** Find a power series representation for the function $f(x) = \ln(5 - x)$ and determine the radius of convergence of the series.

Question 4: ***(1.0 point)*** Show that $\lim\limits_{(x,y)\to(0,0)} \frac{4xy}{x^2+3y^2}$ does not exist.

Question 5: ***(1.0 point)*** Find the directional derivative of $f(x, y) = \sqrt{xy}$ at the point $P(2,8)$ in the direction of the point $Q(5,4)$.

Question 6: ***(1.5 points)*** Find the largest and smallest values of the function $f(x, y) = x^2 + 2x + y^2 - 4y + 12$ over the triangular region R with vertices $(-4,0)$, $(1,0)$ and $(0,4)$.

Question 7: ***(1.0 point)*** A consumer has \$600 to spend on two commodities, the first of which costs \$5 per unit and the second of which costs \$3 per unit. Suppose that the utility derived by the consumer from *x* units of the first commodity and *y* units of the second commodity is given by $U(x, y) = 10x^{0.75}y^{0.25}$. How many units of each commodity should the consumer buy to maximize utility?

Question 8: ***(1.5 points)*** Evaluate the double integral $\iint_D y\,dA$ where D is the region in the first quadrant bounded by the parabola $x = y^2$ and $x = 8 - y^2$.

Note: *No electronic devices, books or notes of any form are allowed.*