201 MATH

Differential and Integral Calculus

Class Times: SUN, TUE, Thur : 08:00-08:50

Class Location: G24 B05

Number of Credits: 4

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Office Hours Booking Link: **https://calendar.app.google/dnv3EXAvABRMXrP77**

Text Book:

Calculus, by Swokowski

Grading Scheme:

Project	5%
Midterm 1st	20%
Midterm 2nd	25%
Tutorial	10%
Final Exam	40%
Total	100%

Attendance:

A student who fails to attend at least 75% of the assigned hours during the semester willbe prevented from entering the final exam.

Classroom Regulations:

Mobile phones should be switched off or silent during the lecture.

Hard copy lecture notes only are allowed.

Recording lectures is strictly not permitted.

MATH 201
(DIFFERENTIAL AND INTEGRAL CALCULUS)

TEXT BOOK

Calculus Classic Edition

Author: Swokowski

Chapter 11 **Infinite Series**	11.1 Sequences. 11.2 Convergent or Divergent Series. 11.3 Positive-Term Series. 11.4 The Ratio and Root Tests. 11.5 Alternating Series and Absolute Convergence. 11.6 Power Series. 11.7 Power Series Representations of Functions. 11.8 Maclaurin and Taylor Series.
Chapter 16 **Partial Differentiation**	16.1 Functions of Several Variables. 16.2 Limits and Continuity. 16.3 Partial Derivatives. 16.4 Increments and Differentials. 16.5 Chain Rules. 16.8 Extrema of Functions of Several Variables. 16.9 Lagrange Multipliers.
Chapter 17 **Multiple Integrals**	17.1 Double Integrals. 17.2 Area and Volume. 17.3 Double Integrals in Polar Coordinates. 17.5 Triple Integrals. 17.7 Cylindrical Coordinates. 17.8 Spherical Coordinates.

MATH 201 EXERCISES (Calculus, Classic Edition by Swokowski)

16.1	1, 3, 5, 8, 9, 14, 21, 22, 23, 24, 37
16.2	3, 5, 6, 9, 12, 14, 16, 19, 20, 25, 26, 28, 29, 37, 38, 42

Find the following limits, if they exist:

(1) $\lim\limits_{(x,y)\to(1,2)} \frac{xy-2x-y+2}{x^2+y^2-2x-2y+5}$ (2) $\lim\limits_{(x,y)\to(1,1)} \frac{x-y^4}{x^3-y^4}$ (3) $\lim\limits_{(x,y)\to(0,0)} \frac{3xy}{5x^4+2y^4}$

(4) $\lim\limits_{(x,y)\to(0,0)} \frac{3x^3-2x^2y+3y^2x-2y^3}{x^2+y^2}$ (5) $\lim\limits_{(x,y)\to(0,0)} \frac{10xy}{5x^3+2y^3}$ (6) $\lim\limits_{(x,y)\to(0,1)} \frac{x+(y-1)^3}{\sqrt{x^2+(y-1)^2}}$

(7) $\lim\limits_{(x,y,z)\to(0,0,0)} \frac{xy+yz+zx}{x^2+y^2+z^2}$ (8) $\lim\limits_{(x,y)\to(0,0)} \frac{xy^3}{x^3+y^6}$ (9) $\lim\limits_{(x,y,z)\to(0,0,0)} \frac{y^3+x^3\sin z^3}{x^2+y^2+z^2}$

(10) $\lim\limits_{(x,y)\to(2,1)} \frac{(y-1)(x-2)^2}{(y-1)^3+(x-2)^3}$ (11) $\lim\limits_{(x,y)\to(0,0)} \frac{3x^2y}{x^4+y^2}$ (12) $\lim\limits_{(x,y,z)\to(0,0,0)} \frac{xy^2}{x^2+y^2+z^2}$

(13) $\lim\limits_{(x,y)\to(1,1)} \frac{3x^3+xy^2-3xy-y^3}{x^2-y^2}$ (14) $\lim\limits_{(x,y)\to(0,0)} \frac{x}{y^2} - \frac{x}{e^{y^2}}$ (15) $\lim\limits_{(x,y)\to(0,0)} \frac{xy}{\sqrt{x^2+y^2}}$

(16) $\lim\limits_{(x,y,z)\to(0,0,0)} f(x,y,z)$ where $f(x,y,z) = \begin{cases} \frac{3xyz}{x^2+y^2+z^2}, & (x,y,z) \neq (0,0,0) \\ 0 & (x,y,z) = (0,0,0) \end{cases}$

Discuss the continuity of the following functions on their domain

(1) $f(x,y) = \begin{cases} \frac{x^3+y^3}{x^2+y^2}, & (x,y) \neq (0,0) \\ 0 & (x,y) = (0,0) \end{cases}$ (2) $f(x,y) = \begin{cases} \frac{x^2y}{x^4+y^2}, & (x,y) \neq (0,0) \\ 0 & (x,y) = (0,0) \end{cases}$

(3) $f(x,y) = \begin{cases} \frac{xy}{|x|+|y|}, & (x,y) \neq (0,0) \\ 0 & (x,y) = (0,0) \end{cases}$ (4) $f(x,y,z) = \begin{cases} \frac{x^3+y^3+z^3}{x^2+y^2+z^2}, & (x,y,z) \neq (0,0,0) \\ 0 & (x,y,z) = (0,0,0) \end{cases}$

(5) $f(x,y,z) = \begin{cases} \frac{xz-y^2}{x^2+y^2+z^2}, & (x,y,z) \neq (0,0,0) \\ 0 & (x,y,z) = (0,0,0) \end{cases}$

(6) $f(x,y,z) = \begin{cases} \frac{xzy^2}{x^2+y^2+z^2}, & (x,y,z) \neq (0,0,0) \\ 0 & (x,y,z) = (0,0,0) \end{cases}$

Discuss the continuity of the following functions on their domain

(1) $h(x,y) = e^{x^2+5xy+y^2}$ (2) $h(x,y) = \sin\sqrt{y-4x^2}$

(3) $h(x,y,z) = \ln(36-4x^2-y^2-9z^2)$ (4) $h(x,y,z) = \frac{xz}{\sqrt{x^2+y^2+z^2-1}}$

16.3	4, 6, 8, 12, 13, 16, 17, 21, 22, 27, 29, 32, 34, 36, 39, 42, 47
	Use the definition to find f_x and f_y for the function $f(x,y) = 3x^2 - 2xy + y^2$
	Let $f(x,y) = e^{x-y}\sin(x+y)$. Show that $(f_x)^2 + (f_y)^2 = \frac{2(f(x,y))^2}{sin^2(x+y)}$
16.4	2, 9, 11, 12, 16, 18, 20, 39, 41
	Use the differential to approximate the change in the function $w = f(x,y,z) = x^2\ln(y^2+z^2)$ as (x,y,z) changes from $(1,2,3)$ to $(0.9,1.9,3.1)$
	Use the differential to approximate the change in the function $w = f(x,y) = yx^{\frac{2}{5}} + \sqrt{x-y}$ as (x,y) changes from $(52,16)$ to $(35,18)$
	Let $f(x,y,z) = \begin{cases} \frac{xy^2z}{x^4+y^4+z^4}, & (x,y,z) \neq (0,0,0) \\ 0 & (x,y,z) = (0,0,0) \end{cases}$ (a) Show that $f_x(0,0,0)$, $f_y(0,0,0)$ and $f_z(0,0,0)$ exist (b) Discuss the differentiability of $f(x,y,z)$ at $(0,0,0)$
16.5	2, 4, 6, 10, 12, 14, 18, 19, 22, 33, 37, 38, 41, 42
	Let $w = f(x,y,z) = x^2+y^2+z^2$, where $x = rcos\,\theta$, $y = rsin\,\theta$ and $z = r$. Use the differentials to show that $dw = 4rdr$
	Let $z = f(x,y)$ be determined implicitly by $x^2+z^2+\cos(xyz) - 4 = 0$. Find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$, then show that $2y\frac{\partial z}{\partial y} - x\frac{\partial z}{\partial x} = \frac{xyz\sin(xyz)}{2z - xy\sin(xyz)}$
16.8	1, 9, 11, 15, 20, 21, 23, 24, 26, 29, 31, 32
16.9	1, 2, 3, 11
17.1	1, 2, 4, 7, 10, 13, 16, 18, 19, 20, 21, 23, 25, 26, 27, 29, 31, 32, 33, 37, 38, 39, 43, 44, 50
	Sketch the region R bounded by the graphs of $y = x$, $y = \sqrt{x}$ and $x = 0$ then evaluate the integral $\iint_R \sin y^2 dA$
	Evaluate the double integral $\int_0^2 \int_{y/2}^1 e^{x^2} dxdy$
17.2	2, 4, 6, 7, 11, 14, 18, 22, 24, 27, 28, 30, 31, 32
	Sketch the region bounded by the graphs of the equations $y = \sin x$, $y = \cos x$, $x = 0$ and $x = \frac{\pi}{4}$ then use a double integral to find its area.
17.3	1, 2, 3, 7, 8, 9, 10, 12, 13, 15, 17, 18, 19, 21, 23, 24
	Use polar coordinates to evaluate the double integral $\int_{-3}^3 \int_0^{\sqrt{9-x^2}} (x^2+y^2)^{\frac{3}{2}} dydx$
17.5	2, 6, 7, 8, 9, 11, 12, 13, 14, 16, 17, 23, 26, 28
17.7	2, 6, 7, 13, 18, 20, 23, 30(a), 40
17.8	2, 3, 11, 14, 25, 28, 35, 36, 39, 40

11.1	3, 5,7, 11, 12, 13, 16, 17, 18, 20, 22, 23, 24, 27—38, 41, 42
11.2	2, 4, 5, 6, 8, 10, 14, 15, 18, 20, 25, 28, 30, 34, 37, 38, 39, 40, 42, 43, 45, 46, 50, 57, 58
11.3	2—10, 14, 15, 16, 18, 20, 22, 23, 24, 25, 26, 30, 31, 33, 34, 35, 39, 40, 42, 43, 45, 46, 57, 58
11.4	2, 4, 6, 8, 9, 10, 11, 12, 14, 15, 16, 18, 20, 21, 22, 23, 25, 27, 28, 29, 31, 32, 33, 34, 35, 38
11.5	2—7, 9, 10, 12, 13, 14, 16, 19, 20, 21, 22, 27, 28, 29, 32, 43, 44, 45, 46
11.6	5, 6, 7, 8, 14, 15, 19, 23, 25, 27, 30 35, 36, 41, 42, 44, 45, 46
11.7	2, 4, 6, 7, 10, 13, 14, 16, 19, 22, 25, 29, 30, 32, 33, 34, 37
11.8	2, 4, 8, 10, 13, 15, 18, 19, 21, 26