MATH 201

HOME WORK PROBLEMS

Title of the book used for this course is : **Calculus**, sixth edition,
by Swokowski, Olinick and Pence.

In this coures we cover chapters 8, 12 and 13, but we start with chapter 12 and 13 then finally chapter 8, also section 10.6 should be read by the students.

Chapter 12

Section 12.1 : Functions of Several Variables;
Do the following problems from the book
1, 3, 5, 8, 9, 14, 21, 22, 23, 24, 26, 27, 47, 51.

Section 12.2 : Limits and Continuity;
I- Do the following problems from the book
3, 5, 6, 9, 12, 14, 16, 19, 20, 25, 26, 28, 29, 36, 38, 42.

II- Find the following limits, if they exist:

1) $lim_{(x,y,z)\to(0,0,0)}\frac{zy^2}{x^2+y^2+z^2}$, **2**) $lim_{(x,y)\to(2,1)}\frac{(y-1)(x-2)^2}{(y-1)^3+(x-2)^3}$.

3) $lim_{(x,y)\to(0,0)}\frac{xy^3}{x^3+y^6}$, **4**) $lim_{(x,y)\to(0,0)}\frac{3x^2y}{x^4+y^2}$, **5**) $lim_{(x,y)\to(0,0)}\frac{10xy}{5x^3+2y^3}$

6) $lim_{(x,y,z)\to(0,0,0)}\frac{y^3+x^3sinz^3}{x^2+y^2+z^2}$.

III- Discuss the continuity of the following functions on their domain:

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

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

3. $f(x,y) = e^{x^2+5xy+y^3}$.

4. $h(x,y) = sin(\sqrt{y-4x^2})$.

5. $k(x,y,z) = ln(36-4x^2-y^2-9z^2)$.

Section 12.3 : Partial Derivatives;
I- Do the following problems from the book
4, 6, 8, 12, 13, 16, 17, 21, 22, 27, 29, 32, 34, 36, 39, 42, 44, 47.

II- Do the following problems;

1. Using the defintion, find f_x, f_y of the function

$$f(x,y) = 3x^2 - 2xy + y^2.$$

2. *Let* $f(x,y) = e^{x-y}sin(x+y)$. Show that

$$(f_x)^2 + (f_y)^2 = \frac{2(f(x,y))^2}{sin^2(x+y)}.$$

Section 12.4 : Increments and Differentials;
Do the following problems from the book
2, 9, 11, 12, 16, 18, 20, 24(b), 32, 38, 42.

1. Use the differential to approximate the change in the function

$$w = f(x,y,z) = x^2\, ln(z^2+y^2)$$

as (x,y,z) changes from $(1,2,3)$ to $(0.9, 1.9, 3.1)$.

2. Use the differential to approximate the change in the function

$$w = f(x,y) = y\, x^{2/5} + x\, \sqrt{y}$$

as (x,y) changes from $(52,16)$ to $(35,18)$.

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

1- Show that $f_x(0,0,0), f_y(0,0,0)$ and $f_z(0,0,0)$ exist.

2- Discuss the differentiability of f at $(0,0,0)$.

Section 12.5 : Chain Rules;
Do the following problems from the book
2, 4, 6, 10, 12, 14, 18, 19, 22, 26, 38, 40, 42.

1. If $w = x^2 + y^2 + z^2$, where $x = rcos\theta$, $y = rsin\theta$ and $z = r$. Use the differential to show that $dw = 4\,r\,dr$.

2. Let $z = f(x,y)$ be determined implicitly by $yx^2 + z^2 + cos(xyz) - 4 = 0$. Find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$. Then show that

$$2\,y\,\frac{\partial z}{\partial y} - x\,\frac{\partial z}{\partial x} = \frac{xyz\,sin(xyz)}{2z - xy\,sin(xyz)}.$$

Section 12.8: Extrema of Functions of Several Variables ;
Do the following problems from the book;
11, 20, 23, 24, 26, 30, 31, 32.

Section 12.9: Lagrange Multipliers ;
Do the following problems from the book;
1, 2, 3, 11.

Chapter 13 : Multiple Integral

Section 13.1: Double Integral ;
Do the following problems from the book;
1 - 10, 13, 16, 18, 19, 20, 21, 23, 25, 26, 27, 29, 31, 32, 33, 37, 38, 39, 43, 44, 50.

1. Sketch the region bounded by the graphs of the given equations, and then evaluate the given integral

$$y = x, y = \sqrt{x}, x = 0; \int\int_R sin\, y^2 dA.$$

2. Evaluate the double integral

$$\int_0^2 \int_{y/2}^1 e^{x^2} dx\, dy.$$

Section 13.2: Area and Volume;
Do the following problems from the book;
2, 4, 6, 7, 11, 14, 18, 22, 24, 27, 28, 30, 31, 32.

1. Sketch the region bounded by the graphs of the equation $y = sin\, x$, $y = cos\, x$, $x = 0$, $x = \pi/4$.. Then use the double intgeral to find its area.

Section 13.3: Double Integral by Polar Coordinate;
Do the following problems from the book;
1 - 12, 13, 15, 17, 18, 19, 21, 23, 24.

1- Use polar coordinate to evaluate the double integral

$$\int_{-3}^3 \int_0^{\sqrt{9-x^2}} (x^2 + y^2)^{3/2}\, dy\, dx.$$

Section 13.5: Triple Integral;
Do the following problems from the book;
2, 6, 7, 8, 9, 11, 12, 13, 14, 16, 17, 23, 26, 28.

Chapter 8

Section 8.1: Sequences;
Do the following problems from the book;

3, 5, 7, 11, 12, 13, 14, 16, 17, 18, 20, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 41, 42, 45, 46.

Section 8.2: Convergent or Divergent Series;
Do the following problems from the book;
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.

Section 8.3 : Positive term Series;
Do the following problems from the book;
2 - 11, 14, 15, 16, 18, 20, 22, 23, 24, 25, 26, 30, 31, 33, 34, 35, 39, 40, 42, 43, 45, 46, 57, 58.

Section 8.4: The Ratio and Root Test
Do the following problems from the book;
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.

Section 8.5: Alternating Series and Absolute Convergence;
Do the following problems from the book;
2 - 7, 9, 10, 12, 13, 14, 16, 18, 19, 20, 21, 22, 27, 28, 29, 32, 33, 34, 35, 38, 40, 41, 43, 44, 45, 46.

Section 8.6: Power Series;
Do the following problems from the book;
5, 6, 7, 8, 14, 15, 19, 23, 25, 27, 30, 35, 36, 41, 42, 44, 45, 46.

Section 8.7: Power Series Represention of Functions;
Do the following problems from the book;
2, 4, 6, 7, 10, 13, 14, 16, 19, 22, 25, 29, 30, 32, 33, 34, 37.

Section 8.8: Maclaurin and Taylor Series;
Do the following problems from the book;
2, 4, 8, 10, 13, 15, 18, 19, 21, 26, 29, 32, 34, 36, 38, 39, 42.