جامعة الملك سعود King Saud University	**Midterm 2 – Math 228- semester 1- 1447H** **Time: 1h 30 min**

Question 1:(4 marks)

Let $f(x,y) = 3x^2 - 12xy + 4y^3 - 36$

Find the local maximum and minimum values and saddle points of $f(x,y)$ **(4 marks)**

Question 2: (14 mark)

1) Evaluate $\int_0^2 \int_0^{x^3} \frac{y}{\sqrt{16+x^7}} dydx$ (**2 marks**)

2) Find the volume of the solid that lies under the paraboloid $4Z = x^2 + y^2$ and above the region in the xy-plane bounded by the polygon with vertices (0,0) , (0,1), (2,0) and (2,1) (**3marks**)

3) Evaluate $\iiint_Q xdV$ where Q is the solid bounded by:

$x = 0\,, y = 0\ ,\ z = 0\ and\ z = 3 - x - y$ (**3 *marks***)

4) Use the cylindrical coordinates to evaluate $\iiint_E x^2 + y^2\, dV$ where E is the region bounded by $z = \sqrt{x^2 + y^2}\ \ and\ \ Z = 4$ (**3 *marks***)

5) Use the spherical coordinates to evaluate $\iiint_E \sqrt{x^2 + y^2 + z^2} dV$ where E is the upper half of the sphere

$E = \{(x,y,z)\ ;\ x^2 + y^2 + z^2 \leq 4\}$ (**3 *marks***)

Question 3: (7 marks)

1) Find partial sum S_n of the arithmetic sequence that satisfies the conditions $a = 4\ ,\ d = -2\ ,\ n = 8$ (**2 *marks***)

2) Find partial sum S_n of the geometric sequence that satisfies the conditions $a = 4\ ,\ r = 3\ ,\ n = 6$ (**2 *marks***)

3) determine whether the following sequence is convergent or divergent:

a) $a_n = 3 + 2^{-n} cos\,(n)$, find its limit. (**2 marks**)

b) $\{a_n\}$ is a geometric sequence with $a = 3\ \ ,\ r = -\frac{4}{3}$, find its limit. **(1 mark)**