King Saud University	College of Sciences		Department of Mathematics
Final Examination	Math 228	Trimester 1 (1444)	Time: 3 Hours

The Examination contains 2 pages

Question 1: (3+3+3)

1. Evaluate $\int_{-2}^{-1}\int_{0}^{3}(4xy^2+y^2)\ dx\ dy$.
2. Evaluate $\iint_R (x^3+4y)\ dA$ where R is the region in the xy-plane bounded by the graphs of the equations $y=x^2$ and $y=2x$.
3. Us polar coordinate to evaluate $\int_{-1}^{1}\int_{0}^{\sqrt{1-x^2}}\sqrt{x^2+y^2}\ dy\ dx$.

Question 2: (3+3+3)

1. Evaluate $\iiint\limits_E (xy+z^2)dV$, where $E=\{(x,y,z),0\le x\le 2,0\le y\le 4,0\le z\le 3\}$.
2. Evaluate $\iiint\limits_Q dV$, where $Q=\{(x,y,z),-2\le x\le 2,x^2\le y\le 4,0\le z\le 4-y\}$.
3. Using spherical coordinates, evaluate $\iiint_E \sqrt{x^2+y^2+z^2}\ dV$, where E lies above the cone $z=\sqrt{x^2+y^2}$ and between the spheres $x^2+y^2+z^2=1$ and $x^2+y^2+z^2=4$.

Question 3: (2+2+2+2)

1. Find the partial sum S_n of the arithmetic sequence that satisfies the given conditions, $a=-2$, $d=23$ and $n=25$.
2. Find the partial sum S_n of the geometric sequence that satisfies the given conditions, $a=5$, $r=2$ and $n=6$.
3. Decide whether the sequence of general term $a_n=2\left(-\frac{1}{3}\right)^n$ converges or diverges. Justify you answer.
4. Use the Binomial theorem to expand the expression $(x+2y)^4$.

Question 4: (2+(2+2+2)+3+3)

1. Find the sum of the series $\sum_{n=1}^{\infty} \frac{1}{(n+2)(n+3)}$.
2. Determine whether the following series converges or diverges. Justify you answer.
   (a) $\sum_{n=1}^{\infty} \frac{2n}{3n+5}$.
   (b) $\sum_{n=1}^{\infty} \left(\frac{3}{5^n} + \frac{2}{n}\right)$.
   (c) $\sum_{n=1}^{\infty} \frac{(-1)^n}{3+5n}$.
3. Determine whether the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{5n+1}$ is absolutely convergent, conditionally convergent, or divergent. Justify your answer.
4. Find the interval of convergence and radius of convergence of the power series $\sum_{n=1}^{\infty} \frac{x^n}{2n-1}$.
5. Find the power series representation of $f(x) = \frac{e^{2x}-1}{x}$.