MATH 105: PRACTICE PROBLEMS FOR CHAPTER 6 AND SEQUENCES AND SERIES: SPRING 2010

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Question 1 : State the change of variable theorem in the plane. How does the element $dxdy$ transform in polar coordinates? How does $dxdydz$ transform in cylindrical and spherical coordinates? Let D be the disk of radius 3 centered at the origin. Evaluate the integral of $f(x,y) = x^2 + y^3$.

Question 2 : Integrate the function z over the unit ball (i.e., all points (x,y,z) with $x^2+y^2+z^2 \le 1$).

Question 3 : Compute the limits of the following sequences, or prove they do not exist: (1) $a_n = \frac{n^2+3}{n^3+2}$; (2) $b_n = \frac{\cos(n^2)}{n}$; (3) $c_n = \frac{n^2+3}{n!}$.

Question 4 : State whether or not the following converge, justifying your reasons: (1) $\sum_{n=0}^{\infty} \frac{2^n}{3^n}$; (2) $\sum_{n=0}^{\infty} \frac{n!}{n!^2}$; (3) $\sum_{n=0}^{\infty} \frac{n!}{(2n)!}$; (4) $\sum_{n=0}^{\infty} \frac{2n}{e^{n^2}}$.

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