PROBLEM SET 10

MATH 2019 – SPRING 2008

1. Find the area of the surface given by $z = f(x, y)$ over the region R.

   (a) $f(x, y) = 2 + \frac{2}{3}y^{3/2}$ $\qquad R = \{(x, y) : 0 \le x \le 2,\ 0 \le y \le 2 - x\}$

   (b) $f(x, y) = xy$ $\qquad R = \{(x, y) : x^2 + y^2 \le 16\}$

2. Determine whether each integral is convergent or divergent. Evaluate the integral if it converges.

   (a) $\displaystyle\int_0^{\infty} xe^{-x^2}\,dx$

   (b) $\displaystyle\int_0^{3} \frac{x}{(x^2 - 9)^{4/3}}\,dx$

   (c) $\displaystyle\int_{-1}^{13} \frac{dx}{\sqrt[3]{2x + 1}}$

3. Determine whether the series is convergent or divergent. If the series converges, find its sum.

   (a) $\displaystyle\sum_{n=0}^{\infty} \frac{(-5)^{n+2}}{2^{2n+1}}$

   (b) $\displaystyle\sum_{n=2}^{\infty} \ln\left(\frac{3n^2 - 1}{2 + 2n^2}\right)$

   (c) $\displaystyle\sum_{k=2}^{\infty} \left(\frac{1}{k - 1} - \frac{1}{k + 1}\right)$

   (d) $\displaystyle\sum_{k=1}^{\infty} \arctan k$

   (e) $\displaystyle\sum_{k=1}^{\infty} (-1)^{k+1} \frac{5^{2k+1}}{3^{3k+3}}$

   (f) $\displaystyle\sum_{k=1}^{\infty} \left(\frac{1}{2k + 3} - \frac{1}{2k + 7}\right)$

   (g) $\displaystyle\sum_{k=1}^{\infty} \cos\frac{1}{k}$

   (h) $\displaystyle\sum_{k=1}^{\infty} \frac{k}{\sqrt{k^2 + 1}}$

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