King Fahd University of Petroleum and Minerals

Department of Mathematical Sciences

Exam # 3, Math 302 – 03

Name:... .....Serial #:..........................

Note: Show all your work to get full credit.

Q.1: Evaluate $\iint\limits_{\Sigma} (\nabla \times \mathbf{F}) \cdot \hat{n}\, d\sigma$ or $\oint\limits_{C} F \cdot dR$ for $F = yx^2\mathbf{i} - xy^2\mathbf{j} + z^2\mathbf{k}$, and Σ is the hemisphere $x^2 + y^2 + z^2 = 9$, $z \geq 0$.

Q.2: Let $z,\ w$, and u be complex numbers. Prove that these numbers form vertices of an equilateral triangle if and only if $z^2 + w^2 + u^2 = zw + wu + uz$.

Q.3: Find the limit $\lim_{n\to\infty}\left\{\dfrac{2n^2+3n^2i}{(2n+1)\,(n-2)}\right\}.$

Q.4: Determine all points where Cauchy-Riemann equations are satisfied for $f\,(z)=\dfrac{-4z^2+1}{z}$ and also determine the points where $f\,(z)$ is differentiable.

Q.5: Determine the center and radius of convergence of the series $\sum_{n=0}^{\infty} \left(\frac{n^n}{(n+1)^n} \right) (z+2-5i)^n$.

Q.6: Find $u(x,y)$ and $v(x,y)$ for $f(z) = e^{\frac{1}{z}}$ such that $f(z) = u + iv$.

Q.7: Determine all the values of $(2+3i)^{1-i}$.

Q.8: Determine the three cube roots of 8.