國立中央大學 107 學年度碩士班考試入學試題

所別： 財務金融學系 碩士班 乙組(一般生)　　共 2 頁　第 1 頁

科目： 微積分

本科考試禁用計算器　　＊請在答案卷(卡)內作答

(10%) 1. Please derive the general solution of the following differential equation:

$$y' = xy + x$$

(10%) 2. Please find the general solution of the the following differential equation:

$$y'' - 5y' + 6y = 0$$

(10%) 3. Given that the random variable X is $N(\mu, \sigma^2)$, please find the probability density function of the random variable $Y = (X - \mu)^2/\sigma^2$.

(10%) 4. Please compute the value of the following integration:

$$\int_{-\infty}^{5} \mathrm{e}^{-32(x-5)^2} dx$$

(10%) 5. Please compute $\frac{\partial P(\sigma)}{\partial \sigma}$, where $P(\sigma)$ is defined as follows:

$$P(\sigma) = K\mathrm{e}^{-rT}\Phi(-d_2) - x\Phi(-d_1),$$

where $d_1 = \frac{\left(\ln\left(\frac{x}{K}\right) + \left(r + \frac{1}{2}\sigma^2\right)T\right)}{\sigma\sqrt{T}}$, $d_2 = d_1 - \sigma\sqrt{T}$, $\Phi(a) = \int_{-\infty}^{a} \frac{1}{\sqrt{2\pi}}\mathrm{e}^{-\frac{1}{2}z^2} dz$, and x, K, r and T are constant.

注意:背面有試題

參考用

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(10%) 6. Please find the volume of the region in the first octant bounded by the coordinate planes, the plane $x + y = 4$, and the cylinder $y^2 + 4z^2 = 16$.

(10%) 7. Please compute

$$\int_0^{2/3} \int_y^{2-2y} (x + 2y)\mathrm{e}^{(y-x)} dx dy.$$

(10%) 8. The region bounded by the parabola $y = x^2$ and the line $y = 3x$ in the first quadrant is revolved about y-axis to generate a solid. Please find the volume of the solid.

(10%) 9. Find the local extreme values of the function $f(x, y) = xy - x^2 - y^2 - 2x - 2y + 4$.

(10%) 10. Find an orthogonal diagonalization of the matrix A,

$$A = \begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$$

that is, find an orthogonal matrix C such that $C^{-1}AC$ is a diagonal matrix D.

注意:背面有試題