

考試注意事項：

1. 答案紙直行對折，兩直欄書寫作答。
2. 無清楚計算過程，不予計分。

試題：

1. (10%) Find the equations of the tangent plane and normal line to the ellipsoid with equation $4x^2 + y^2 + 4z^2 = 16$ at the point $(1, 2, \sqrt{2})$.
2. (10%) Find the relative extrema of $f(x, y) = x^3 + y^2 - 2xy + 7x - 8y + 2$.
3. (10%) Find the surface area of the part of the paraboloid $z = 9 - x^2 - y^2$ that lies above the plane $z = 5$.
4. (10%) Evaluate the integral $\iiint_T f(x, y, z) dV$, where $f(x, y, z) = y$ and T is the region bounded by the plane $x = 0$, $y = 0$, $z = 0$, and $2x + 3y + z = 6$.
5. (15%) Use the method of Lagrange multipliers to find the extrema of the function $f(x, y) = x^2y$ subject to the inequality constraint $4x^2 + y^2 \leq 4$.
6. (15%) Evaluate the integral $\int_0^1 \int_{2y}^2 e^{-x^2} dx dy$.
7. (15%) Evaluate $\iiint_B e^{(x^2+y^2+z^2)^{3/2}} dV$, where B is the part of the unit ball $x^2 + y^2 + z^2 \leq 1$ lying in the first octant.
8. (15%) Evaluate the integral by making a suitable change of variables:

$$\iint_R e^{(x+y)/(x-y)} dA,$$

where R is the trapezoidal region with vertices $(-2, 0)$, $(-1, 0)$, $(0, 1)$, and $(0, 2)$.