

1. Calculate (a)  $\frac{d}{dx}(x^2)^x$  (b)  $\int x\sqrt{x+1}dx$  (10%)
2. Sketch the graph of  $f(x) = 3x^{5/3}/5 - 3x^{2/3}$ , and indicate the extrema, inflection points, concavity, cusp (if any), and asymptotes (if any). (20%)
3. Calculate the arc length of the cardioid  $r = (1-\cos\theta)$ , locate the centroid of the arc, and determine the area of the surface generated by revolving the curve about the x-axis. (20%)
4. Determine the series  $\sum_{k=2}^{\infty} a_k$  converges or diverges.  $a_k = \sum_{n=2}^{\infty} 1/k^n$ . Find the sum, if it converges. (10%)
5. Find the Taylor series expansion of  $e^{-2x}$  and give the radius of convergence. (10%)
6. Find the absolute extreme values of the function  $f(x, y) = 4xy - x^2 - y^2 - 6x$  on the triangular region  $D = \{(x, y) : 0 \leq x \leq 2, 0 \leq y \leq 3x\}$ . (10%)
7. Evaluate the double integral  $\int_0^1 \int_{x^2}^1 \frac{x^3}{\sqrt{x^4 + y^2}} dy dx$ . (10%)
8. Let  $T$  be a solid with a piecewise-smooth boundary. Show that if  $f$  and  $g$  have continuous second partials, then the flux of  $\nabla f \times \nabla g$  out of  $T$  is zero. (10%)

試題隨卷繳回