

國立彰化師範大學105學年度第1學期學士班轉學生招生考試試題

系所： 數學系

年級： 二年級

科目： 微積分

☆☆請在答案紙上作答☆☆

共 1 頁，第 1 頁

1. Show that  $\lim_{x \rightarrow 1} 2x + 1 = 3$ . (10%)
2. Find the volume of the prism whose base is the triangle in the  $xy$ -plane bounded by the  $x$ -axis and the lines  $y=x$  and  $x=1$  and whose top lies in the plane  $z = 4 - x - y$ . (10%)
3. Find the area of the region  $\mathbf{R}$  that lies inside the cardioids  $r = 1 + \cos \theta$  and outside the circle  $x^2 + y^2 = 1$ . (10%)
4. Find the length of the parametric curve  $C = \{(e^t \cos t, e^t \sin t) : 0 \leq t \leq 1\}$ . (10%)
5. Suppose that  $f$  and  $g$  are any twice-differentiable functions of one variable. Show that  $w(x, t) = f(x - ct) + g(x + ct)$  satisfies  $\frac{\partial^2 w}{\partial t^2} = c^2 \frac{\partial^2 w}{\partial x^2}$  for any  $c \in \mathbf{R}$ . (10%)
6. Find the values of following integrals: (1)  $\int_0^{\infty} x e^{-x/2} dx$  (2)  $\int_0^1 \sqrt{x^2 + 1} dx$  (20%)
7. Find following indefinite integrals: (1)  $\int \frac{x^4 + 1}{x^2(x^2 + 4x + 5)} dx$  (2)  $\int x^2 \ln(x) dx$  (20%)
8. Find the absolute maximum and minimum of the function  $x \sqrt{4 - x^2}$ , for  $x \in [-2, 2]$  (10%)