

系所組別 製造資訊與系統研究所丙組

考試科目 微積分

考試日期：0307 · 節次：3

※ 考生請注意 本試題 可 不可 使用計算機

- (15 pts) A recording tape 0.001 inch thick is wound around a reel whose inner radius is 0.5 inch and whose outer radius is 2 inches. How much tape is needed to fill the reel?
- (15 pts, 5pts each) Evaluate (a) $\lim_{x \rightarrow 1^+} (\frac{1}{\ln x} - \frac{1}{x-1})$, (b) $\lim_{t \rightarrow \infty} (1 + \frac{1}{t})^t$, and (c) $\lim_{x \rightarrow 0} \frac{\sin^{-1} x}{x}$
- (35 pts, 5pts each) Find (a) $\frac{d}{dx} e^x$, (b) $\frac{d}{dx} e^x$, (c) $\frac{d}{dx} x^x$, (d) $\frac{d}{dx} x^x$, (e) $\frac{d}{dx} (\ln|\cos x|)$, (f) $\frac{d}{dx} (\ln \frac{x(x^2+1)^2}{\sqrt{2x^3-1}})$, and (g) $\frac{d}{dx} (\frac{3x-1}{x^2+3})^2$
- (10 pts) Given $x^2 + y^2 = 25$, find $\frac{d^2y}{dx^2}$
- (5 pts) Find $\int \frac{\sec x}{\tan^2 x} dx$
- (5 pts) Find the area of the region bounded by $y = \frac{x}{x^2+1}$, the x-axis, and the line $x=3$.
- (10 pts) The rate of change of the number of coyotes $N(t)$ is a population proportional to $650 - N(t)$, where t is the time in years. When $t=0$ the population is 300, and the population increases to 500 when $t=2$. Find the population when $t=3$.
- (5 pts) The half-life of carbon-14 is about 5715 years. A sample contains 1 gram of carbon-14. How much will be present in 10,000 years?