系所組別：企業管理學系丙組

考試科目：微積分 考試日期：0223，節次：3

※ 考生請注意：本試題不可使用計算機。 請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

**Part A True/ False [Totally 50 points, 5 points each]**

1. Given three functions f, g, and h. The composite function f ∘ g ∘ h is found by the order h, g, and then f as follows: (f ∘ g ∘ h)(x) = f(g(h(x))). Therefore, if $f(x)=\frac{x+1}{x}$, $g(x)=x^8$, and $h(x)=x+5$, (f ∘ g ∘ h)(x) will be equal to $\frac{(x+5)^8+1}{(x+5)}$.
2. $\lim_{x\to 1}\frac{x+x^2+x^3+...+x^n-n}{x-1}=\frac{n(n+1)}{2}$
3. If $\lim_{x\to 3} f(x)=0$ and $\lim_{x\to 3} g(x)=0$, then $\lim_{x\to 3}[f(x)/g(x)]$ does not exist.
4. Let $y=e^{\sec 3\theta}$. Therefore, $dy/d\theta = e^{\sec 3\theta}\sec 3\theta\tan 3\theta$.
5. If $y=|x^2+3x-18|$, then $dy/dx$ do not exist at x = 3 or -6.
6. The equation of the tangent line to the curve $y=(x-1)e^x+3\ln x+2$ at the point (1,2) is y = (e+1)x-(e+3).
7. $\frac{d}{dx}\int_1^{x^4}\sec t\,dt=\sec(x^4)\cdot 4x^3$.
8. $\int\frac{e^{2x}}{e^x+1}dx=e^x-x+\ln|1+e^{-x}|+C$, where C is a constant.
9. The value of $\int_t^{t+2\pi}(\sin x+\cos x)dx$ is independent of t.
10. If the Maclaurin series for $e^x$ is known as $\sum_{n=0}^{\infty}\frac{x^n}{n!}=1+\frac{x}{1!}+\frac{x^2}{2!}+\frac{x^3}{3!}+....$ Then the value of $\lim_{x\to 0}\frac{e^x-1-x}{x^2}$ is equal to 1/2.

**Part B Short Answer and Calculation [Totally 50 points]**

1. **[10 points]** After the testing, a light bulb manufacturer confirms that the reliability function of the bulb is R(x) = $\lambda e^{-\lambda x}$, where $\lambda$ is equal to 0.005 and x is the life time of the bulb with the unit as hours. (a) What percentage of a bulb will fail less than or equal to 500 hours? (b) What percentage of a bulb will fail more than or equal to 500 hours? (c) What percentage of a bulb will last more than 1000 hours but less than 1500 hours?
2. **[10 Points]** Let $f(x)=\begin{cases}\frac{k}{x}, 1\le x\le e^3\\ 0, \text{otherwise}\end{cases}$. (a) Determine the value of k to make f(x) be a probability density function. (b) What is the probability of $x\le 4$? (c) Evaluate the value of constant "a" that p ( x > a) = 1/3.

（背面仍有題目，請繼續作答）

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3. **[10 points]** For the equation $9x^2 - 4y^2 - 72x + 8y + 176 = 0$. Please get (a) focus/ foci, (b) vertex/ vertices, and (c) asymptote(s).

4. **[10 points]** A store operates an iPod customizing service. The cost to refurbish x iPod in a month is calculated to be $C(x) = 0.25x^2 + 40x + 1000$ dollars. The store charge \$80 per iPod for work. (a) Calculate the marginal revenue and profit functions. (b) Compute the revenue and profit, and also the marginal revenue and profit, if the store has refurbished 20 units this month. Also, interpret your answer. (What are the meanings of these four numbers?) (c) For which value of x is the marginal profit is zero? Interpret your answer.

5. **[10 points]** (a) Find out $\lim_{x \to 0} \frac{1 - \cos 2x}{\sin x}$ (b) If $y = \ln \frac{x+1}{\sqrt{x-2}}$, get $dy / dx$.