編號： 466　系所：環境醫學研究所甲組　　科目：微積分

本試題是否可以使用計算機：☑可使用 ，☐不可使用 （請命題老師勾選）

1. An object launched vertically upward from ground level with an initial velocity of 72 m/s is located

$$s(t) = 72t - (4.9)t^2$$

meters above ground level at time t seconds. According to this position function,
(a) when does the object stop rising? (5%)
(b) what is its maximum height? (5%)

2. The top portion of a coffee maker has the shape of a cone 10 cm high. The radius at the top is 4 cm. Coffee is flowing from the top section into the bottom section at a rate of 4 cm^3/s. At what rate is the level of coffee in the top section falling when the coffee in the top section is 4 cm deep? (10%)

3. Find $\int x^2(x^3+7)^4\,dx$. (10%)

4. Find the area of the region R bounded above by the graph of $y = |x-3|$ and below by the x-axis for $1 \le x \le 6$. (10%)

5. Find $f'(x)$ for (a) $f(x) = \ln 3x$, (5%) and (b) $f(x) = x\ln(1+x^2)$. (5%)

6. Find $\int e^x \cos x\,dx$. (10%)

7. Find the Taylor polynomials P_0, P_1, P_2,…, P_5 for $f(x) = \sin x$ expanded about $a = 0$. (10%)

8. Find the area of the region enclosed by the graph of the cardioid $r = 1 + \cos\theta$. (10%)

9. Let f be an arbitrary function of two variables with continuous second order partial derivatives. Express $\partial^2 f / \partial r^2$ in terms of the second order partial derivatives of f with respect to x and y. (10%)

10. Find the general solution for the nonhomogeneous equation as following: $y''+2y'-3y = e^t$ (10%)