編號： 146

國立成功大學 108 學年度碩士班招生考試試題

系　所：環境工程學系

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。

1. Find the slope of the tangent line $(16-x)y^2 = x^3$ at the given point $(2,3)$. Round your answer to two decimal places. (5 points)

2. Locate the absolute extrema of the function $f(x) = \sin \pi x$ on the closed interval $\left[0, \frac{1}{3}\right]$. (5 points)

3. Please find the derivate of the following functions. (5 points each, 15 points total)

(1) $g(t) = \frac{10 \log_4 t}{t}$　(2) $y(\ln x) + y^2 = 0$, find $\frac{dy}{dx}$　(3) $y = \sqrt{\frac{x^2-1}{x^2+1}}$, find $\frac{dy}{dx}$

4. A rectangle (see Figure 1) is bounded by the *x*- and *y*-axes and the graph of $y = (5-x)/2$. What length and width should the rectangle have so that its area is a maximum. (10 points)

5. Use the shell method to find the volume of the solid generated by revolving the plane region bounded by $y = 4x^2$ and $y = 10x - x^2$, about the line $x = 2$. (10 points)

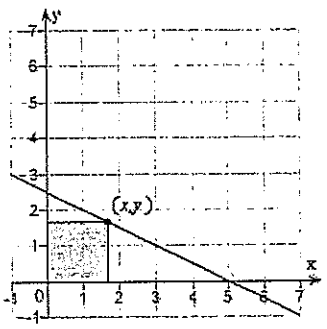

Figure 1

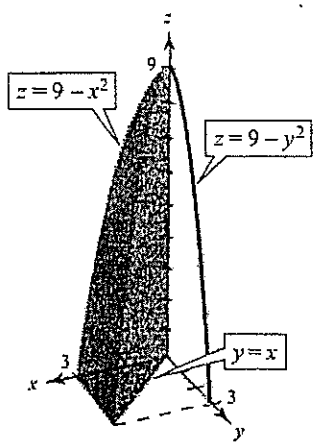

Figure 2

6. Find the particular solution of $\frac{dy}{dt} = e^{y-2t}$ that satisfies the initial condition $y(0) = 0$. (10 points)

7. Please find or evaluate the integral of the following functions. (6 points each, 30 points total)

(1) $\int \sin^4(\pi\theta) d\theta$　(2) $\int \frac{\arcsin 2x}{\sqrt{1-4x^2}} dx$　(3) $\int \frac{x^2}{\sqrt{2x-x^2}} dx$

(4) $\int \frac{1}{x^2(a+bx)} dx$　(5) $\int \frac{5x}{e^{2x}} dx$

8. Use a triple integral to find the volume of solid shown in Figure 2. (15 points)

$Q = \{(x,y,z) : 0 \le x \le 3, 0 \le y \le x, 0 \le z \le 9 - x^2\}$