

1.  $\int_1^2 \ln x dx = ?$  (10pts)

2.  $\int_0^1 x e^{2x^2} dx = ?$  (10pts)

3. If  $f(x) = e^{3\ln(x+1)}$ , then  $f'(x) = ?$  (10pts)

4.  $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2} = ?$  (10pts)

5.  $\lim_{x \rightarrow 0^+} (x+1)^{\cot x} = ?$  (10pts)

6. Please find the tangent line of  $y = x^2$  at  $x=1$ . (10pts)

7. Let  $p(x) = \frac{800}{x+3} - 3$ , be the price function. Please find  $x$ , such that the revenue function  $x p(x)$  is maximum.? (10pts)

8. 將一張 30cm 乘 40cm 紙板的 4 個角各剪去一個相同正方形，然後摺成一紙盒，請問如何剪去這個正方形(問其大小)，可使作成紙盒的體積最大? (10pts)

9. If  $f(x, y) = y e^{x^2 y}$ , then  $f_x(x, y) = ?$   $f_y(x, y) = ?$  (10pts)

10. If  $f(x) = \begin{cases} ax + b, & x \geq 1 \\ x^2 + 1, & x < 1 \end{cases}$ , then please find  $a, b$  such that  $f$  is differentiable at  $x=1$ . (10pts)