1. Solve the Integral $\int \frac{\sin x \cos x}{a + b\cos^2 x}\, dx$

2. Integral $\int_{(0,1)}^{(1,2)} [(x^2 - y)\,dx + (y^2 + x)\,dy]$ by the following path: (a) Straight Line : from (0,1) to (1,2)
   (b) parabolic Curve $x = t$, $y = t^2 + 1$

3. Determine the value of x in order to sure that Infinite series $\sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{(2n+1)}$ be an absolute Convergent Series.

4. Solve the differential Equation
   $$3x - x^2 + 2y^2 - xy^2 + 2xy\,y' = 0$$

5. Solve : $x^3 y''' + xy' - y = x \log x$

6. Solve :
   $$(y^2 + z^2)\,dx - 2(xy + yz)\,dy + (x^2 + y^2)\,dx = 0$$

7. A Function is given as
   $$F(x,y) = \begin{cases} \frac{x^2 y}{x^4 + y^2}, & x = 0 \quad y \neq 0 \\ 0 & x = y = 0 \end{cases}$$
   Prove that F is not Continuous at point (0,0)

8. A Function F(x) is given as
   $$F(x) = x^4 - 4x^3 - 2x^2 + 12x + 7$$
   (a) Find the Maximum and minimum value of F(x)
   (b) Find the point of reflexion
   (c) Plot the Curve F(x)

國立成功大學 7[illegible] 學年度 工程科學研究所 考試（Calculus 試題） 共 1 頁 第 1 頁

1. solve the Integral $\int \frac{\sin x \cos x}{a+b\cos^2 x}\,dx$

2. Integral $\int_{(0,1)}^{(1,2)} [(x^2-y)dx+(y^2+x)dy]$ by the path

   (a) straight line from (0,1) to (1,2)
   (b) parabolic Curve $x=t$, $y=t^2+1$

3. Find the value of x that the Infinite series $\sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{(2n+1)}$ can be an absolute convergent Series.

4. Solve the differential Equation

   $3x-x^3+2y^2-xy^2+2xyy'=0$

5. Solve the differential Equation

   $x^3y'''+xy'-y=x\log x$

6. Solve the differential Equation

   $(y^2+z^2)dx-2(xy+yz)dy+(x^2+y^2)dx$

7. A known function F is given as

   $$F(x,y)=\begin{cases}\frac{x^2y}{x^4+y^2}, & x\neq 0 \quad y\neq 0\\ 0 & x=y=0\end{cases}$$

   prove that F is not continuous at the point (0,0)

8. Given : $F(x)=3x^4-26x^3+16x^2+9$

   (a) Find the Maximum and Minimum Value of F(x)
   (b) Find the point of reflexion
   (c) Plot F(x)