

## Engineering Mathematics Homework 1 - Solution

1.  $f(x) = \frac{(x^2 + 4x + 13)(x - 2)^2}{(x^2 + 3x + 3)(x + 1)^4}$ , 求  $\frac{df(x)}{dx} = ?$

Sol:

$$\ln f(x) = \ln(x^2 + 4x + 13) + 2\ln(x - 2) - \ln(x^2 + 3x + 3) - 4\ln(x + 1)$$

$$\begin{aligned}\frac{df(x)}{dx} &= \frac{(x^2 + 4x + 13)(x - 2)^2}{(x^2 + 3x + 3)(x + 1)^4} \left( \frac{2x + 4}{x^2 + 4x + 13} + \frac{2(x - 2)}{(x - 2)^2} - \frac{2x + 3}{x^2 + 3x + 3} - \frac{4(x + 1)^3}{(x + 1)^4} \right) \\ &= \frac{(x^2 + 4x + 13)(x - 2)^2}{(x^2 + 3x + 3)(x + 1)^4} \left( \frac{2x + 4}{x^2 + 4x + 13} + \frac{2}{x - 2} - \frac{2x + 3}{x^2 + 3x + 3} - \frac{4}{x + 1} \right)\end{aligned}$$

2.  $\int (x^2 + 3x + 3)\sin x dx = ?$  (使用分部積分)

Sol:

$x^2 + 3x + 3$	$\oplus$	$\sin x$
$2x + 3$	$\ominus$	$-\cos x$
$2$	$\oplus$	$-\sin x$
$0$	$\ominus$	$\cos x$

$$\Rightarrow (x^2 + 3x + 3)(-\cos x) - (2x + 3)(-\sin x) + 2(\cos x) + c$$

$$= -(x^2 + 3x + 1)\cos x + (2x + 3)\sin x + c$$

3.  $\frac{\partial^2 u(x, y)}{\partial x^2} + x \frac{\partial u(x, y)}{\partial y} = 0$

問: 此方程式為\_\_\_\_階\_\_\_\_次\_\_\_\_D.E.

Sol:

二階一次P.D.E.

DCNLAB可靠計算暨網路實驗室