Date........

Ques 1 Determine the analytic funcⁿ whose real part is $e^{2x}(x\cos 2y - y\sin 2y)$

Solⁿ) $e^{2x}(x\cos 2y - y\sin 2y)$

$$\frac{\delta u}{\delta x} = e^{x}\left(1(\cos 2y - 0)\right) + 2e^{2x}(x\cos 2y - y\sin 2y)$$
$$= e^{x}\cos 2y$$

$$= e^{2x}(\cos 2y + 2x\cos 2y - 2y\sin 2y) = \phi_1(x,y)$$
$$\phi_1(z,0) = e^{-2z}(0) = 0$$

By milne thomson method.

$$F(z) = \int \phi_1(z,0)\,dz, \quad \int \phi_2(z,0)\,dz + c$$

$$= \int e^{2z}(1+2z)\,dz - 0 + c$$

$$= (1+2z)\left(\frac{e^{2z}}{2}\right) - 2\left(\frac{e^{2z}}{4}\right) + c.$$

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v is given as $x/(x^2+y^2)$

$$\frac{dv}{dx} = \frac{(1)(x^2+y^2) - x(2y)}{(x^2+y^2)^2}$$

$$\left.\begin{matrix} x \to z \\ y \to 0 \end{matrix}\right\} \frac{\delta v}{\delta x} = \frac{z^2 - 2z^2}{z^4} = \frac{1}{z^2}$$

$$\frac{\delta v}{\delta y} = -2yx/x^2+y^2 = 0$$

$$\frac{dw}{dz} = 0 + \left(-1/z^2\right)$$

$$\int \delta w = -i\int \frac{1}{z^2}\,dz$$

$$w = i/z$$

$$f(z) = \frac{1}{z} \quad \& \quad (i+1)\,f(z) = f(z)$$

$$\boxed{f(z) = \left(\left(\frac{i}{i+1}\right)\frac{1}{z}\right)}$$