(1) Show that if $z = \frac{(x_1 + j y_1)}{(x_2 + j y_2)}$ $z^* = \frac{(x_1 - j y_1)}{(x_2 - j y_2)}$

$$\frac{x_1 + j y_1}{x_2 + j y_2}\left(\frac{x_2 - j y_2}{x_2 - j y_2}\right) \Rightarrow \frac{(x_1 + j y_1)(x_2 - j y_2)}{x_2^2 - y_2^2}$$

$$z = \frac{x_1 + x_2 + y_1 y_2 - x_1 y_2 j + x_2 y_1 j}{x_2^2 - y_2^2}$$

Re Im

$$z = \frac{x_1 + x_2 + y_1 - y_2}{x_2^2 + y_2^2} + j\frac{x_2 y_1 - x_1 y_1}{x_2^2 + y_2^2}$$

put integers in $x_1 = 4$ $x_2 = 3$ $y_1 = 2$ $y_2 = 1$

$$z = \frac{4(2) + 2(2)}{9 + 1} + j\frac{6 - 8}{10}$$

$$\boxed{z = \frac{14}{10} + j\frac{2}{10}}$$

If variables are added the conjugation will convert the possitive to a negative.

(3) Prove that $\cos(x) = \frac{1}{2}\left(e^{jx} + e^{-jx}\right)$

Use Euler's formula

so

we can say

$$\cos(x) = \frac{1}{2}\left(\cos(x) + i\sin(x) + \cos(x) - i\sin(x)\right)$$

$$\cos(x) = \frac{1}{2}\left(2\cos(x)\right)$$

$$\cos(x) = \cos(x) \blacksquare$$

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