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$$\frac{Z=x_1+jy_1}{x_2+jy_2} (x_2-jy_2) = \frac{(x_1+jy_1)(x_2-jy_2)}{x_2+y_2}$$

$$\frac{= x_1 x_2 + y_1 y_2 - x_1 y_2 + x_2 y_1 + x_2 y_2 + x_2 y_1 +$$

$$\frac{Z = \frac{x_{1}x_{2} + y_{1}y_{2}}{x_{2}^{2} + y_{2}^{2}} + j \frac{x_{2}y_{1} - x_{1}y_{2}}{x_{2}^{2} + y_{2}^{2}} = \frac{x_{1}x_{2} + y_{2}^{2}}{x_{2}^{2} + y_{2}^{2}} = \frac{x_{1}x_{2} + y_{2}^{2}}{x_{2}^{2}} = \frac{x_{1}x_{2} + y_{2}^{2}}{x$$

$$\frac{Z^* = x_1 - jy_1}{x_2 - jy_2} \frac{(x_2 + jy_2)}{(x_2 + jy_2)} = \frac{(x_1 - jy_1)(x_2 + jy_2)}{x_2^2 + y_2^2}$$

$$= \frac{x_1x_2 + y_2x_1 - y_1x_2 + y_1y_2}{x_2^2 + y_2^2}$$

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

Therefore the complex conjugate of z holds as z\* ,



2. (BONUS) COSC 360: HW1

$$SIN(x) = x - \frac{x^3}{31} + \frac{x^5}{51} - \frac{x^{\frac{3}{2}}}{7!} \cdots$$
 \* Taylor's Sories

$$COS(x) = 1 - \frac{x^2}{a!} + \frac{x^4}{4!} - \frac{x^6}{6!} \cdots$$

$$e^{x} = 1 + \frac{x^{1}}{1!} + \frac{x^{2}}{2!} + \dots$$

\*Eulur's formula

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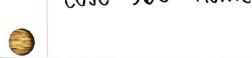
$$e^{jx} = 1 + (jx) + \frac{(jx)^2}{2!} + \frac{(jx)^3}{3!} + \cdots$$

$$= | + j \times + \frac{x^2}{2!} + j \frac{x^3}{3!} + \frac{x^4}{4!} + \dots$$

$$\left(1 + \frac{x^2}{2!} + \frac{x^4}{4!}\right) + j\left(x + \frac{x^3}{3!} + \frac{x^5}{5!}\right)$$

$$\int e^{jx} = \cos(x) + \sin(x)$$

COSC 360: Homework mat townsend



3) Prove 
$$\cos(x) = \frac{1}{2}(e^{ix} + e^{-ix})$$

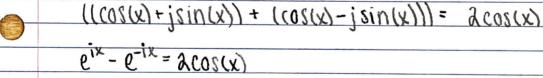
$$e^{ix} = \sum_{i=0}^{\infty} \frac{(jx)^n}{n!} = \sum_{i=0}^{\infty} \frac{j^n x^n}{n!} = \sum_{i=0}^{\infty} \frac{y^{2n}}{n!} + \sum_{i=0}^{\infty} \frac{x^{2n+1}}{(2n+1)!}$$

$$e^{ix} = \sum_{i=0}^{\infty} (-1)^n \frac{x^{2n}}{(2n)!} + \sum_{i=0}^{\infty} 1^{2n+1} \frac{x^{2n+1}}{(2n+1)!}$$

$$e^{ix} = \cos(x) + i\sin(x)$$

$$e^{-ix} = cos(-x) + jsin(-x) = cos(x) - jsin(x)$$

$$e^{-ix} = cos(-x) + jsin(-x) = cos(x) - jsin(x)$$



$$(= \cos(x) = \frac{1}{3}(e^{ix} - e^{-ix})$$