KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET, DAN TEKNOLOGI
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INSTITUT TEKNOLOGI SEPULUH NOPEMBER
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QUIZ/~~ETS~~/~~EAS~~ | SEMESTER GASAL/~~GENAP~~ | TAHUN ..2022.. / ..2023..

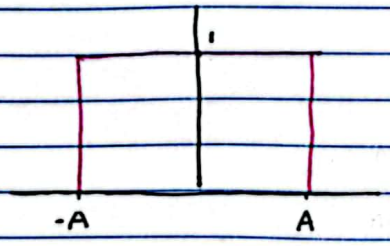
MATA KULIAH : Pemrosesan Sinyal dan Optimisasi — KODE : .....
HARI, TANGGAL : Jumat, 13 Oktober 2023 — KELAS : D
DOSEN : ..... — RUANG : .....

NAMA : Hanin Ainussyamsi Prabowo	TANDA TANGAN	NILAI
NRP : 5009211036		
DOSEN WALI :		

Tentukan Fourier Transform dari grafik di bawah ini !

Manual Solution -

①



$$X(\omega) = \int_{-\infty}^{\infty} x(t)\, e^{-j\omega t}\, dt$$

$$= \int_{-A}^{A} e^{-j\omega t}\, dt$$

$$= \left[-\frac{1}{j\omega} e^{-j\omega t} \right]_{-A}^{A}$$

$$= \left[-\frac{1}{j\omega} e^{-j\omega A} \right] + \frac{1}{j\omega} e^{j\omega A}$$

$$= \frac{1}{j\omega} e^{j\omega A} - \frac{1}{j\omega} e^{-j\omega A}$$

$$= \frac{e^{j\omega A} - e^{-j\omega A}}{j\omega}$$

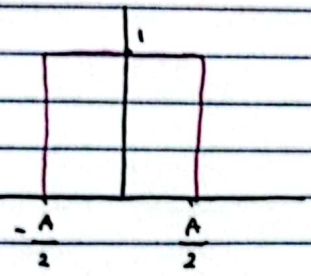
$$= \frac{1}{\omega} \left[\frac{e^{j\omega A} - e^{-j\omega A}}{j} \right] \times \frac{2}{2}$$

$$= \frac{2}{\omega} \left[\frac{e^{j\omega A} - e^{-j\omega A}}{2j} \right]$$

$$= \frac{2}{\omega} \sin(\omega A)$$

$$X(\omega) = A \operatorname{sinc}(\omega A)$$

①



$$X(w) = \int_{-\infty}^{\infty} x(t)\, e^{-jwt}\, dt$$

$$= \int_{-\frac{A}{2}}^{\frac{A}{2}} e^{-jwt}\, dt$$

$$= \left[-\frac{1}{jw} e^{-jwt} \right]_{-\frac{A}{2}}^{\frac{A}{2}}$$

$$= \left[-\frac{1}{jw} e^{-\frac{jwA}{2}} \right] + \frac{1}{jw} e^{\frac{jwA}{2}}$$

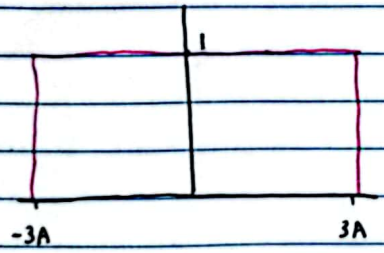
$$= \frac{e^{\frac{jwA}{2}} - e^{-\frac{jwA}{2}}}{jw} \times \frac{2}{2}$$

$$= \frac{2}{w} \left[\frac{e^{\frac{jwA}{2}} - e^{-\frac{jwA}{2}}}{2j} \right]$$

$$= \frac{2}{w} \sin\left(\frac{wA}{2}\right)$$

$$\boxed{X(w) = A \operatorname{sinc}\left(\frac{wA}{2}\right)}$$

③



$$X(w) = \int_{-\infty}^{\infty} x(t)\, e^{-jwt}\, dt$$

$$= \int_{-3A}^{3A} e^{-jwt}\, dt$$

$$= \left[-\frac{1}{jw} e^{-jwt} \right]_{-3A}^{3A}$$

$$= \left[-\frac{1}{jw} e^{-j3wA} \right] + \frac{1}{jw} e^{j3wA}$$

$$= \frac{e^{j3wA} - e^{-j3wA}}{jw} \times \frac{2}{2}$$

$$= \frac{2}{w} \left[\frac{e^{j3wA} - e^{-j3wA}}{2j} \right]$$

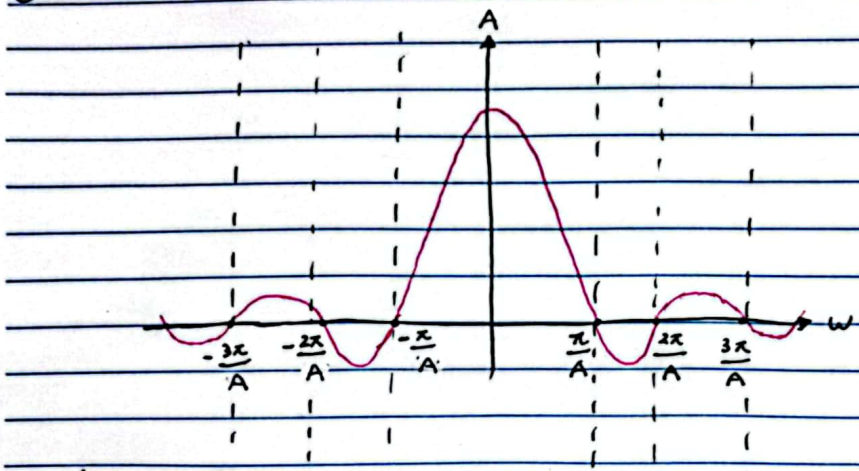
$$= \frac{2}{w} \sin(3wA)$$

$$\boxed{X(w) = A \operatorname{sinc}(3wA)}$$

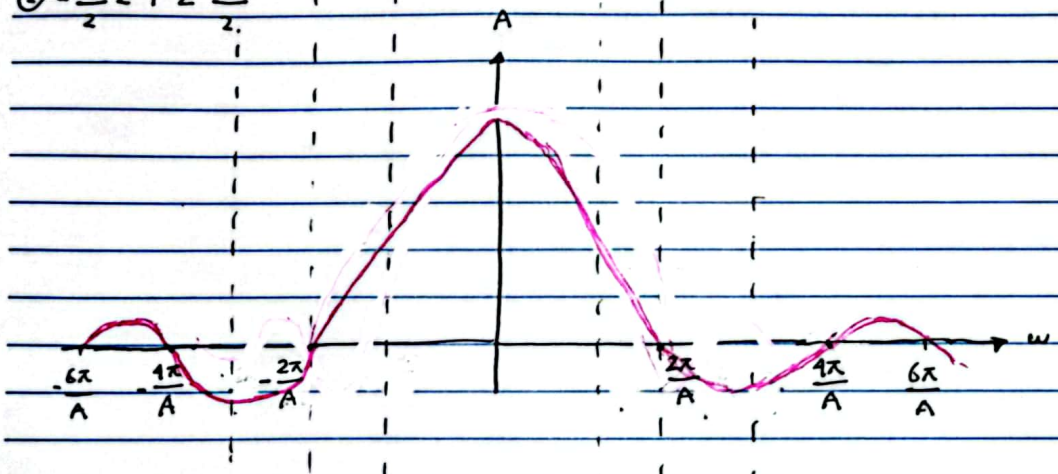
Manual Graphic

Setelah mendapatkan transformasi fourier dari 3 grafik di atas, maka dapat disajikan manual graphic dari FT sebagai berikut.

① $-A < T < A$



② $-\frac{A}{2} < T < \frac{A}{2}$



③ $-3A < T < 3A$