Tutorial 1 - EE3731C Signal Processing Methods

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1. Assume $FT\big(f(x)\big) = F(u)$, $FT\big(g(x)\big) = G(u)$, prove the following properties:
   a. Scaling property: $FT\big(f(cx)\big) = \frac{F(\frac{u}{c})}{|c|}$
   b. Convolution property: $FT(f(x) * g(x)) = F(u)G(u)$

2. Use the definition of the Fourier transform to find the transform of the following signals:
   a. $f(x) = \cos(2\pi Ax)$
   b. $g(x) = \sin(2\pi Ax)$

Note: $\delta(u - A) = \int_{-\infty}^{\infty} e^{i2\pi x(u-A)} dx$

3. Write the Fourier series for the following periodic function:

$$f(x) = \begin{cases} 1, & 0 < x < \pi \\ -1, & -\pi < x < 0 \end{cases}$$