1 $s(t) = u(t)$.

The fourier transform of $s(t)$ is ~~s(w)~~ $S(F)$

$$\cancel{s(w)}\ S(F) = \int_{-\infty}^{\infty} s(t)\, e^{-j\omega t}\, dt.$$

$$u(t) = \begin{cases} 1 & 0 \leq t \leq 1 \\ 0 & \text{otherwise.} \end{cases}$$

$$S(F) = \int_{-\infty}^{\infty} u(t)\, e^{-j\omega t}\, dt$$

$$= \int_{0}^{t} u(t)\, e^{-j\omega t}\, dt.$$

$$= \int_{0}^{1} (1)\, e^{-j\omega t}\, dt$$

$$= -\frac{1}{j\omega} \left[e^{-j\omega t} \right]_{0}^{1}$$

$$= \frac{-1}{j\omega} \left[e^{-j\omega} - e^{-j\omega(0)} \right]$$

$$S(F) = \frac{1}{j\omega} \left[1 - e^{-j\omega} \right]$$

$$S(F) = \frac{1-e^{-j\omega}}{j\omega} = \cancel{1-[\cos - \sin]}$$

$$= 1 - [\cos(\omega) - j[\sin(\omega)]]$$

$$S(F) = \frac{1-\cos(\omega) + j\sin\omega}{j\omega}$$

$$= \frac{\sin\omega}{\omega} - \frac{j[1-\cos\omega]}{\omega}$$

$$|S(F)| = \frac{1}{\omega}\sqrt{\sin^2\omega + (1-\cos\omega)^2}$$

$$= \frac{1}{\omega}\sqrt{1 + 1 - 2\cos\omega}$$

$$= \frac{1}{\omega}\sqrt{2 - 2\cos\omega}$$

$$= \frac{1}{\omega}\sqrt{2\times 2\sin^2\frac{\omega}{2}}$$

$$|S(F)| = \boxed{\frac{2}{\omega}\sin\frac{\omega}{2}}$$