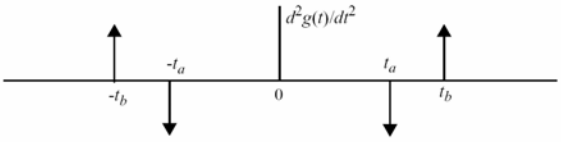
Problem 2.28

(a) Taking the Fourier transform of both sides of $\frac{d^2 g(t)}{dt^2} = \sum_i k_i \delta(t - t_i)$, we get

$$(j2\pi f)^2 G(f) = \sum_i k_i \exp(-j2\pi f t_i)$$

Therefore, $G(f) = \frac{-1}{4\pi^2 f^2} \sum_i k_i \exp(-j2\pi f t_i)$

(b) Differentiating the trapezoidal pulse of Fig. 2.42 twice, we get:



Hence,

$$G(f) = \frac{-A}{4\pi^2 f^2 (t_b - t_a)} [\exp(j2\pi f t_b) - \exp(j2\pi f t_a) - \exp(j2\pi f t_a) - \quad + \exp(j2\pi f t_b)]$$

$$= \frac{-A}{2\pi^2 f^2 (t_b - t_a)} [\cos(j2\pi f t_b) - \cos(j2\pi f t_a)]$$

$$= \frac{-A}{2\pi^2 f^2 (t_b - t_a)} \sin[\pi f (t_b - t_a) \sin \pi f (t_b + t_a)]$$