Solution #1

$$E_g = \int_{-\infty}^{\infty} x^2(t)\,dt$$
$$= \int_0^{\infty} \left(A e^{-\alpha t} + B e^{-\beta t}\right)^2 dt$$
$$= \int_0^{\infty} \left(A^2 e^{-2\alpha t} + B^2 e^{-2\beta t} + 2AB\, e^{-(\alpha+\beta)t}\right) dt$$
$$= \frac{A^2}{-2\alpha}\left[e^{-2\alpha t}\right]_0^{\infty} + \frac{B^2}{-2\beta}\left[e^{-2\beta t}\right]_0^{\infty} + \frac{2AB}{-(\alpha+\beta)}\left[e^{-(\alpha+\beta)t}\right]_0^{\infty}$$
$$= \frac{A^2}{2\alpha} + \frac{B^2}{2\beta} + \frac{2AB}{(\alpha+\beta)}$$

Solution #2: There is no such thing as a periodic energy signal. We then more or less easily find:

$e^{-\alpha t} u(t),\ \alpha > 0 \longrightarrow$ non periodic energy signal

$\sin(t) + \cos(3t) \longrightarrow$ periodic power signal

$(1+\mathrm{sinc}(t/2))\cos(3t) \longrightarrow$ non-periodic power signal (only possibility cuz the other ones are all taken).

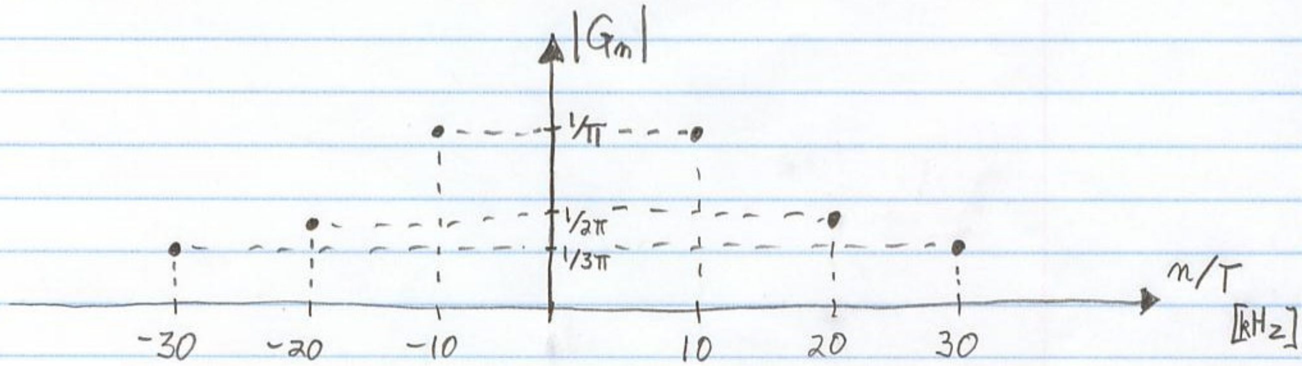
Solution #3(a) Since the signal is real we have $G_{-n} = G_n^*$ and since we are only required to sketch the amplitude spectrum we only need to calculate

$$|G_0| = 1$$

$$|G_{+1}| = |G_{-1}| = 1/\pi \approx 0.3183\cdots$$

$$|G_{+2}| = |G_{-2}| = 1/2\pi \approx 0.15915\cdots$$

$$|G_{+3}| = |G_{-3}| = 1/3\pi \approx 0.1061\cdots$$



Solution #3(b)

$$A_0 = G_0 = A/2$$

$$A_n = 2\,\mathrm{Re}(G_n) = 0 \quad \text{si } n = 1, 2, 3, \ldots$$

$$B_n = -2\,\mathrm{Im}(G_n) = \frac{-A}{\pi n} \quad \text{si } n = 1, 2, 3, \ldots$$

$$g(t) = \frac{A}{2} - \sum_{n=1}^{\infty} \frac{A}{\pi n} \sin(2\pi n t/T)$$

$$= A\left(\frac{1}{2} - \frac{1}{\pi}\left(\sum_{n=1}^{\infty} \frac{1}{n} \sin(2\pi n t/T)\right)\right)$$

works; verified with SageMath.