m2pm3prob8(11).tex

M2PM3 PROBLEMS 8. 17.3.2011

Q1. Show that for $p, q \geq 0$,

$$\int_{-\infty}^{\infty} \frac{\cos px - \cos qx}{x^2} dx = -\pi(p-q).$$

Q2. Show that for $a > 0$

$$I := \int_0^{\infty} \frac{dx}{x^4 + a^4} = \frac{\sqrt{2}\pi}{4a^3}.$$

Q3. Show that

$$\sum_{n=-\infty}^{\infty} \frac{1}{1+n+n^2} = \frac{2\pi}{\sqrt{3}} \tanh(\pi\sqrt{3}/2).$$

Q4. Evaluate

$$\int_0^{\infty} \frac{\sin mx}{x} dx$$

for all real m.

NHB