COMPLEX VARIABLES HOMEWORK DUE APRIL 16TH

Compute the (Cauchy Principle Value of the) following integrals. Note: these problems are collected from Sections 8.4, 8.5 and 8.6 of your textbook. Do put an effort into justifying every single thing along the lines of ML-inequalities. Enjoy!

(1) $\displaystyle\int_{-\infty}^{\infty} \frac{\cos(x)\,dx}{x^2+9}$ and $\displaystyle\int_{-\infty}^{\infty} \frac{\sin(x)\,dx}{x^2+9}$

(2) $\displaystyle\int_{-\infty}^{\infty} \frac{x\cos(x)\,dx}{x^2+9}$ and $\displaystyle\int_{-\infty}^{\infty} \frac{x\sin(x)\,dx}{x^2+9}$

(3) $\displaystyle\int_{-\infty}^{\infty} \frac{x\sin(x)\,dx}{(x^2+4)^2}$

(4) $\displaystyle\int_{-\infty}^{\infty} \frac{\cos(x)\,dx}{(x^2+4)^2}$

(5) $\displaystyle\int_{-\infty}^{\infty} \frac{\cos(x)\,dx}{(x^2+4)(x^2+9)}$

(6) $\displaystyle\int_{-\infty}^{\infty} \frac{x^3\sin(x)\,dx}{x^4+4}$

(7) P.V. $\displaystyle\int_{-\infty}^{\infty} \frac{dx}{x^3+1}$

(8) P.V. $\displaystyle\int_{-\infty}^{\infty} \frac{x^4\,dx}{x^6-1}$

(9) P.V. $\displaystyle\int_{-\infty}^{\infty} \frac{\cos(x)\,dx}{x^2-x}$

(10) P.V. $\displaystyle\int_{-\infty}^{\infty} \frac{\cos(x)\,dx}{1-x^2}$

(11) P.V. $\displaystyle\int_{0}^{\infty} \frac{dx}{x^{2/3}(1+x)}$

(12) P.V. $\displaystyle\int_{0}^{\infty} \frac{dx}{x^{1/2}(1+x)}$

(13) P.V. $\displaystyle\int_{0}^{\infty} \frac{\ln(x)\,dx}{x^2+4}$

(14) P.V. $\displaystyle\int_{0}^{\infty} \frac{x^{1/3}\ln(x)\,dx}{x^2+1}$.