Practice Integrals

Be sure to show your work for all parts of the integral, including showing the C_R part goes the 0.

(A) Evaluate the integral

$$\int_0^\infty \frac{x}{1+x^5}\,dx$$

using a contour which goes from 0 to R along the real axis, then follows $\frac{1}{5}$ of the circle radius R counterclockwise, then returns to 0 along the angle $\frac{2\pi}{5}$.

(B) Evaluate the integral

$$\int_0^\infty \frac{\cos x}{(x^2+1)^2}\,dx$$

using the upper half circle contour.

(C) Evaluate the integral

$$\int_0^\infty \frac{\ln x}{1+x^4}\,dx$$

using a quarter circle contour (coming back along the imaginary axis) or the upper half circle.

(D) Evaluate the integral

$$\int_0^\infty \frac{x^{\frac{1}{2}}}{x^2+1}\,dx$$

using full circle "pacman" contour, along the branch cut at $\theta = 0$, around the circle, and back at $\theta = 2\pi$.

Answers that I got (please inform me if you find errors):

(A) $\frac{\pi}{5\sin(3\pi/5)}$ (B) $\frac{\pi}{2e}$ (C) $\frac{-\pi^2}{8\sqrt{2}}$ (D) $\frac{\pi}{\sqrt{2}}$