

Advanced Mathematical Methods Assignment # 1

1) Evaluate the integral given below

(a) $\int_{-\infty}^{\infty} \frac{\sin ax}{x} dx$, a real constant.

(b) $\oint_C z^k dz$, k an integer, and C: $|z|=1$.

(c) $\oint_C z^2 e^{i/z} dz$, C: $|z|=1$.

(d) $\int_0^{\infty} \frac{\log x}{x^2 + a^2} dx$, $a > 0$

2) Find inverse Laplace transform

$$F(s) = \frac{1}{\sqrt{s}}$$

$$F(s) = \log(s)$$

(3) Find the inverse Laplace transform of $\frac{1}{s(s^4+1)}$ using the residue calculus.