

Name: _____

Date: _____

Question:	1	2	3	4	Total
Points:	15	20	20	20	75
Score:					

Method of residues

1. (15 points) Calculate the integral for real a , $|a| < 1$, and integer non-negative n :

$$I = \int_{-\pi}^{\pi} \frac{\cos n\varphi}{1 - 2a \cos \varphi + a^2} d\varphi.$$

Sketch the integration contour. Indicate the position(s) of the pole(s) of the integrand. Compare your answer with the result produced by a computer algebra system.

2. (20 points) Calculate the integral:

$$I = \int_0^{\infty} \frac{\sin^2 x}{1 + x^4} dx.$$

Sketch the integration contour. Indicate the position(s) of the pole(s) of the integrand. Compare your answer with the result produced by a computer algebra system.

3. (20 points) Calculate the integral:

$$I = \int_0^{\infty} \frac{dx}{(1 + x^2)^2}.$$

Sketch the integration contour. Indicate the position(s) of the pole(s) of the integrand. Compare your answer with the result produced by a computer algebra system.

Integral to stump a computer algebra system

4. (a) (15 points) Construct an definite integral that you can evaluate analytically but a computer algebra can not. Use the method described in the handout “The integral that stumped Feynman”.
- (b) (5 points) To verify your result evaluate your integral and your answer numerically.

Use a computer algebra system (CAS) for finding the real or imaginary parts of a complex expression and numerics. Enclose a printout of you CAS session.