

## Residues

### TASKS

Use an appropriate Laurent series to find the indicated residue.

1.  $f(z) = \frac{2}{(z-1)(z+4)}$ ; Res( $f(z)$ , 1)

Answer: 2/5

2.  $f(z) = \frac{4z-6}{z(2-z)}$ ; Res( $f(z)$ , 0)

Answer: -3

Find the residue at each pole of the given function.

3.  $f(z) = \frac{z}{z^2+16}$

Answer: Res( $f(z)$ , -4i)=1/2, Res( $f(z)$ , 4i)=1/2

4.  $f(z) = \frac{5z^2-4z+3}{(z+1)(z+2)(z+3)}$

Answer: Res( $f(z)$ , -1)=6, Res( $f(z)$ , -2)=-31, Res( $f(z)$ , -3)=30

5.  $f(z) = \sec z$

Answer: Res( $f(z)$ ,  $\frac{(2n+1)\pi}{2}$ ) =  $(-1)^{n+1}$ ,  $n \in Z$

Use Cauchy's residue theorem, where appropriate, to evaluate the given integral along the indicated contours.

6.  $\oint_C \frac{1}{(z-1)(z+2)^2} dz$  (a)  $|z| = \frac{1}{2}$

Answer: 0

(b)  $|z| = \frac{3}{2}$

Answer:  $2\pi i/9$

(c)  $|z| = 3$

Answer: 0

Use Cauchy's residue theorem to evaluate the given integral along the indicated contour.

7.  $\oint_C \frac{1}{z^2+4z+13} dz$ ,  $C : |z - 3i| = 3$

Answer:  $\pi/3$

8.  $\oint_C \frac{\tan z}{z} dz$ ,  $C : |z - 1| = 2$

Answer: -4i