

1. Find the residues of the following functions at 0.

- (a) $(z^2 + 1)/z$
- (b) $(z^2 + 3z - 5)/z^3$
- (c) $(\sin z)/z^4$
- (d) $(\sin z)/z^5$
- (e) $(\sin z)/z^6$
- (f) $(\sin z)/z^7$
- (g) e^z/z
- (h) e^z/z^2
- (i) e^z/z^3
- (j) $e^z/\sin z$

2. Show:

$$(a) \int_{-\infty}^{\infty} \frac{1}{x^6 + 1} dx = 2\pi/3 \quad (b) \int_0^{\infty} \frac{x^2}{x^6 + 1} dx = \pi/6$$

3. Let R be the rectangle oriented clockwise shown below. Find the integrals:

$$(a) \int_R \frac{1}{z^2 - 3z + 5} dz \quad (b) \int_R \frac{1}{z^2 + z + 1} dz \quad (c) \int_R \frac{1}{z^2 - z + 1} dz$$

