

$$\int_{\gamma} \frac{\sin z}{z^2 (z-2i)^3} dz$$

$f(z)$

$$z_0 = -2i \quad r = 3$$

$$\int_{\gamma} \frac{\sin z}{z^2 (z-2i)^3} dz = \frac{2\pi i}{1!} \cdot \frac{-i}{8} = \frac{\pi}{4}$$

$$f'(z) = \frac{\cos(z)(z-2i) - 3\sin(z)}{(z-2i)^4}$$

$$f'(0) = \frac{-2i}{16} = \frac{-i}{8}$$