Evaluate $\int_C 3|z|^2 dz$, where C is the straight line segment from –2 to i in the complex plane. [102 宜蘭電機 5]

[解]C的方程式為 $y = \frac{0-1}{-2-0}(x+2) \Rightarrow x - 2y + 2 = 0$

$$dz = dx + idy = d(2y-2) + idy = (2+i)dy, |z|^2 = x^2 + y^2 = (2y-2)^2 + y^2 = 5y^2 - 8y + 4$$

$$\int_C 3|z|^2 dz = \int_0^1 3(5y^2 - 8y + 4)(2+i)dy = 3(2+i)\cdot(\frac{5y^3}{3} - 4y^2 + 4y)\Big|_0^1 = 5(2+i)$$