

MATH4060 Exercise 3

Deadline: October 16, 2015.

The questions are from Stein and Shakarchi, *Complex Analysis*, unless otherwise stated.

Chapter 2. Exercise 11, 12.

Chapter 3. Exercise 15(a)(d), 19, 22.

Chapter 5. Exercise 8, 9, 10, 11, 13.

Additional Exercise. Show that if $c > 0$, then

$$\frac{1}{2\pi i} \int_{c-i\infty}^{c+i\infty} \frac{a^s}{s(s+1)} ds = \begin{cases} 0 & \text{if } 0 < a \leq 1 \\ 1 - \frac{1}{a} & \text{if } a \geq 1. \end{cases}$$

Here the integral is over the vertical line $\operatorname{Re} s = c$. (Hint: Consider the straight line contour from $c - iR$ to $c + iR$. Complete this by a semi-circular arc centered at c and of radius R , either in the clockwise or the anti-clockwise direction, as appropriate.)