Norges teknisk–naturvitenskapelige universitet
Institutt for matematiske fag

TMA4120 Matematikk 4K H2009

Øving 8

Oppgavene er, med unntak av oppgave 10, hentet fra Kreyszig *Advanced Engineering Mathematics* 9. utgave.

1 (K9 13.4:17)
Is $u = x^3 - 3xy^2$ harmonic?

If yes, find a corresponding analytic function $f(z) = u(x, y) + iv(x, y)$

2 (K9 13.4:22)
Determine a such that $u = e^{3x} \cos ay$ is harmonic, and find a harmonic conjugate.

3 (K9 13.5:16)
Write $3 + 4i$ in polar form.

4 (K9 13.5:21)
Find all solutions of $e^z = 4 - 3i$ and graph some of them in the complex plane.

5 (K9 13.6:7)
Compute $\cos(1 + i)$ (in the form $u + iv$).

6 (K9 13.6:18)
Find all solutions of $\sin z = 100$.

7 (K9 13.7:11)
Find all values of $\ln(-1)$ and graph some of them in the complex plane.

8 (K9 13.7:21)
Solve for z:

$$\ln z = 2 + \frac{1}{4}\pi i.$$

9 (K9 13.7.27)
Find the principal value of $i^{1/2}$.

10 a) For which points in the complex plane is the equality

$$\mathrm{Im}\left(\frac{z}{1-i}\right) = 0$$

satisfied?

b) For which points in the complex plane is the equality

$$\mathrm{Im}\left(\frac{z}{1-i}\right) > 0$$

satisfied?