MTH101:   Tutorial 2

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Exercise 0.1

Find out, and give reasons, whether $f(z)$ is continuous at $z = 0$ if $f(0) = 0$ and for $z \neq 0$ the function f is equal to

1. $(\text{Im } z^2)/|z|^2$
2. $(\text{Re } z^2)/|z|$

Exercise 0.2

*Determine whether the following $f(z)$ is differentiable at 0, if yes,
find the derivative $f'(0)$; if not, state the reason.*

1 $f(z) = i(1-z)^n$;

2 $f(z) = \operatorname{Re} z$

Exercise 0.3

Are the following functions analytic?

1. $f(z) = iz\bar{z}$;
2. $f(z) = e^y(\sin x + i\cos x)$;
3. $f(z) = 1/(z - z^5)$

Exercise 0.4

Verify that the function $v(x, y) = xy$ is Harmonic, and find its Harmonic Conjugate u so that $f = u + iv$ is analytic.

Exercise 0.5

Write in the form $u + iv$ the following functions

1. $e^{-\pi z}$

2. $\exp(z^2)$

Exercise 0.6

Compute all the values of

1 $\ln(-1)$;

2 $(-1)^{2-i}$.