Show to the course assistant latest on 4.11.

1. Write in polar coordinate form

a) $-2i$	b) $-1+i$	c) $1+\sqrt{3}i$
d) $\sqrt{3}+i$	e) -15	f) 0

2. Find all cubic roots of $u = 2+2i$, in other words, solutions of the equation $z^3 = u$.

3. Show that if $z \in C$, where in polar coordinates $z = re^{i\phi}$, complex logarithm function can be defined as follows:

$$\ln z = \ln r + i\phi + i2\pi n, \qquad n \in Z.$$

Hint: ln is the inverse function of exponent function. Thus, show that $e^{\ln z} = z$. Function $\ln z$ is an example of a multivalued complex function.

4. Study if

a) $y = \sin x + x^2$ a solution of $\dfrac{\mathrm{d}^2 y}{\mathrm{d}x^2} + y = x^2 + 2$,

b) $x = \cos t - 2\sin t$ a solution of $x'' + x = 0$,

c) $\theta = 2e^{3t} - e^{2t}$ a solution of $\dfrac{\mathrm{d}^2\theta}{\mathrm{d}t^2} - \theta\dfrac{\mathrm{d}\theta}{\mathrm{d}t} + 3\theta = -2e^{3t}$ and

d) $y = 3\sin 2x + e^{-x}$ a solution of $y'' + 4y = 5e^{-x}$?

5. Are the differntial equations

a) $(ye^{xy} + 2x)\mathrm{d}x + (xe^{xy} - 2)\mathrm{d}y = 0$

b) $xy\mathrm{d}x + \mathrm{d}y = 0$

c) $(3r - \theta - 1)\mathrm{d}\theta + \theta\mathrm{d}r = 0$

separable, exact or linear? The equations can belong to more than one category.