Exercise 1 22pts

a) (2.5pts) Determine $\frac{1+2i}{3-4i}$ in the algebraic form

b) (3pts) Determine the argument of $z = z_1 - z_2$, with $z_1 = 2cis(80°)$ and $z_2 = cis(-10°)$

c) (3pts) Express the complex number $z = \frac{-\overline{z_1}}{(2z_2)^3}$ in the trigonometric form, with $z_1 = 4cis(20°)$ and $z_2 = 2cis(40°)$.

d) (2.5pts) Solve the equation $2z - 3\bar{z} = 5 - 2i$

e) (6pts) Precisely describe the geometric shapes defined by
1) $z \cdot \bar{z} = 4$ 2) $Re(i\,\bar{z}) = 2$ 3) $\arg(z^3) = \arg(1 - i)$

f) (5pts) Among the five solutions of the equation $z^5 = -7 + 24i$, determine the real part of the one that is the closest to the imaginary axis. *Give your answer rounded to 3 digits.*

Exercise 2 6pts

Determine the value of m so that $z_1 = -2i$ is a root of $p(z) = z^4 + 4z^3 - 17z^2 + 16z + m$. For that value, solve $p(z) = 0$.

Exercise 3 3pts

Give a polynomial equation, in the expended form, with real coefficients whose zeros form a square with area 9 in the complex plane.

Exercise 4 4pts

Determine the quotient and the remainder of $(iz^3 - 4z^2 + (1 + 4i)z - 8) : (z^2 + iz + 3)$