# Worksheet: Complex Numbers

1. Solve $r^2 + 16 = 0$

2. Solve $r^2 + 2r + 3 = 0$.

3. Given $z = 12 - 5i$. Find

   (a) real part of $z$

   (b) imaginary part of $z$

   (c) modulus of $z$

4. Find the distance between $z = 1 - i$ and $z = 2i$.

5. Given $z_1 = 4 - i$, $z_2 = -5 + 3i$. Find

   (a) $2z_1 - z_2 =$

   (b) $z_1 z_2 =$

   (c) $\bar{z} =$

   (d) $\dfrac{1}{2}(z_1 + \overline{z_1}) =$

   (e) $\dfrac{1}{2i}(z_1 - \overline{z_1}) =$

6. Given $z_1 = x_1 + iy_1$ and $z_2 = x - iy_2$. Find

   (a) $\dfrac{1}{2}(z_1 + \overline{z_1}) =$

(b) $\dfrac{1}{2i}(z_1 - \overline{z_1}) =$

7. The roots of characteristic equation with **real** coefficients are complex conjugate.

8. Write in the form $a + ib$ the following complex numbers $(1+i)^2$, $(1+i)^3$ and $(1+i)^n$.

9. Given $z = 2(cos\frac{\pi}{10} + i \sin\frac{\pi}{10})$. Find modulus and argument of $\overline{z}$.

10. Given $z = \lambda + i\mu$.

    (a) Find $\mathrm{Re}(e^z)$ and $\mathrm{Im}(e^z)$.

    (b) Show that $e^{\bar{z}} = \overline{e^z}$.