

## FORMULAE/REVISION HINTS FOR SECTION F

### COMPLEX NUMBERS

$$z = a + jb = r(\cos \theta + j \sin \theta) = r \angle \theta = re^{j\theta} \text{ where } j^2 = -1$$

$$\text{Modulus } r = |z| = \sqrt{a^2 + b^2} \quad \text{Argument } \theta = \arg z = \tan^{-1}\left(\frac{b}{a}\right)$$

$$\text{Addition:} \quad (a + jb) + (c + jd) = (a + c) + j(b + d)$$

$$\text{Subtraction:} \quad (a + jb) - (c + jd) = (a - c) + j(b - d)$$

$$\text{Complex equations:} \quad \text{If } m + jn = p + jq \text{ then } m = p \text{ and } n = q$$

$$\text{Multiplication:} \quad \text{If } z_1 = r_1 \angle \theta_1 \text{ and } z_2 = r_2 \angle \theta_2$$

$$z_1 z_2 = r_1 r_2 \angle (\theta_1 + \theta_2)$$

$$\text{Division:} \quad \text{If } z_1 = r_1 \angle \theta_1 \text{ and } z_2 = r_2 \angle \theta_2$$

$$\frac{z_1}{z_2} = \frac{r_1}{r_2} \angle (\theta_1 - \theta_2)$$

$$\text{De Moivre's theorem:} \quad [r \angle \theta]^n = r^n \angle n\theta = r^n (\cos n\theta + j \sin n\theta) = re^{j\theta}$$

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