1) - $f(x)$ is of degree 4 $\Rightarrow$ it has exactly 4 complex zeros.

- $f(x)$ has real coefficients $\Rightarrow$ if z is a zero, then $\bar{z}$ is also a zero.

- $4-5i$ is a zero $\Rightarrow$ $\overline{4-5i} = 4+5i$ is a zero.

- $8i$ is a zero $\Rightarrow$ $\overline{8i} = -8i$ is a zero.

D

2) - $f(x)$ is of degree 3 $\Rightarrow$ it has exactly 3 complex zeros.

- Since $3-2i$ is a zero, $\overline{3-2i} = 3+2i$ is also a zero.

- $f(x) = (x+4)\left(x-\underbrace{(3-2i)}_{a}\right)\left(x-\underbrace{(3+2i)}_{b}\right)$

Trick: $(x-a)(x-b) = x^2-(a+b)x+ab$

$$\begin{cases} a+b = (3-2i)+(3+2i) = 6 \\ ab = (3-2i)(3+2i) = 3^2-(2i)^2 = 9+4 = 13 \end{cases}$$

- $f(x) = (x+4)(x^2-6x+13)$

$= x^3-2x^2-11x+52$

A

3) - $f(x) = x^3 + 7x^2 - 16x + 18$

- $1+i$ is a zero $\Rightarrow$ $1-i$ is also a zero.

- $f(x)$ has a factor $\left(x - \underbrace{(1+i)}_{a}\right)\left(x - \underbrace{(1-i)}_{b}\right)$

$$a+b = (1+i) + (1-i) = 2$$
$$ab = (1+i)(1-i) = 1^2 - i^2 = 2$$

$$= x^2 - 2x + 2$$

- ~~Using long div~~ $f(x) = (x^2 - 2x + 2)(\ldots\ldots)$

- Comparing the leading coeff, then the constant term, we get

$f(x) = (x^2 - 2x + 2)(x + 9)$

$\Rightarrow$ the third zero is -9.

A

4) $2+2i$

$x=2, \; y=2$

$r=\sqrt{x^2+y^2}=\sqrt{2^2+2^2}=\sqrt{8}=2\sqrt{2}$

$\cos\theta=\frac{x}{r}=\frac{2}{2\sqrt{2}}=\frac{1}{\sqrt{2}}$

$\sin\theta=\frac{y}{r}=\frac{2}{2\sqrt{2}}=\frac{1}{\sqrt{2}}$

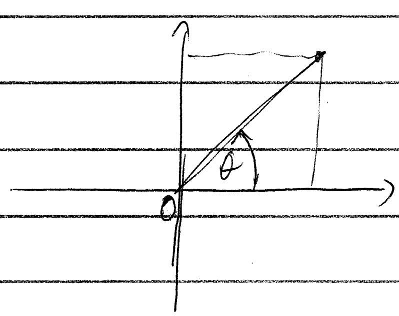
$\Rightarrow \theta=\frac{\pi}{4} \quad (=45^\circ)$

$2+2i=2\sqrt{2}\,(\cos 45^\circ + i\sin 45^\circ)$

C

<u>Remark</u>: we can use $\tan\theta=\frac{y}{x}=\frac{2}{2}=1$

$\Rightarrow \theta=45^\circ+k\cdot180^\circ$



Choose $k=1$ because the point is in the first quadrant.