

SCORE: ____ / 10 POINTS

NO CALCULATORS ALLOWED

Find all third roots of $27i$.

$27i$ (0, 27)

SCORE: ____ / 4 POINTS

$$27i = 27 \operatorname{cis} \frac{\pi}{2} \quad \frac{1}{2}$$

$$R = \sqrt[3]{27} = 3$$

$$\phi = \frac{\pi}{3} + \frac{2n\pi}{3}$$

$$= \frac{\pi}{3} + \frac{2n\pi}{3} \quad \frac{1}{2}$$

$$\phi = \frac{\pi}{3}, \frac{5\pi}{3}, \frac{3\pi}{2} \quad 1$$

$\frac{1}{2}$

$$3 \operatorname{cis} \frac{\pi}{6} = 3\left(\frac{\sqrt{3}}{2} + \frac{1}{2}i\right) = \frac{3\sqrt{3}}{2} + \frac{3}{2}i \quad \frac{1}{2}$$

$$3 \operatorname{cis} \frac{5\pi}{6} = 3\left(-\frac{\sqrt{3}}{2} + \frac{1}{2}i\right) = -\frac{3\sqrt{3}}{2} + \frac{3}{2}i \quad \frac{1}{2}$$

$$3 \operatorname{cis} \frac{3\pi}{2} = 3(0 - i) = -3i \quad \frac{1}{2}$$

Convert the rectangular equation $x^2 + y^2 - 4x = 0$ to polar form. Simplify your answer.

SCORE: ____ / 3 POINTS

$$r^2 \cos^2 \theta + r^2 \sin^2 \theta - 4r \cos \theta = 0$$

$$r^2 - 4r \cos \theta = 0$$

$$r(r - 4 \cos \theta) = 0$$

$$r = 0 \text{ or } r = 4 \cos \theta$$

↑

NOT NEEDED SINCE $r = 0$
 IS THE POLE, WHICH IS

INCLUDED IN THE GRAPH OF $r = 4 \cos \theta$ (WHEN $\theta = \frac{\pi}{2}$)

$\frac{1}{2}$ POINT EACH

Convert the polar equation $r = \frac{6}{3 + 2 \cos \theta}$ to rectangular form. Simplify your answer.

SCORE: ____ / 3 POINTS

$$r = \frac{6}{3 + \frac{2x}{r}}$$

$$r(3 + \frac{2x}{r}) = 6$$

$$3r + 2x = 6$$

$$\frac{1}{2} \quad 3\sqrt{x^2 + y^2} = 6 - 2x$$

$$9x^2 + 9y^2 = 36 - 24x + 4x^2$$

$$5x^2 + 9y^2 + 24x - 36 = 0 \quad \frac{1}{2}$$