**Polar $\mathbb{C}$ WS** **Name:**

Example 1: Convert $3+4i$ into polar form:

- Step 1: find the radius $= \sqrt{3^2+4^2} = 5$
- Step 2: find the angle $= \tan^{-1}\frac{4}{3} \approx 53^\circ$
- Put it all together:
  $3+4i = 5(\cos 53 + i\sin 53)$
  or
  $3+4i = 5e^{53i\pi/180}$

Example 2 Convert $4e^{\pi i/4}$ —aka $4(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4})$ into rectangular form.

- Step 1: find $x = 4\cos\frac{\pi}{4} = 2\sqrt{2}$
- Step 2: find $y = 4\sin\frac{\pi}{4} = 2\sqrt{2}$
- Put it together: $4e^{\pi i/4} = 2\sqrt{2} + 2\sqrt{2}i$

1. Find the polar form of $3\sqrt{3}+3i$
2. Find the polar form of $6\sqrt{3}+6i$
3. Find the polar form of $2+2\sqrt{3}i$
4. Find the polar form of $5+5i$
5. Find the polar form of $4-3i$
6. Find the polar form of $12+5i$
7. Find the polar form of $8-6i$
8. Find the rectangular form of $4e^{3\pi i/4}$—aka $4(\cos\frac{3\pi}{4} + i\sin\frac{3\pi}{4})$
9. $2e^{\pi i/3}$ —aka $2(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3})$
10. $6e^{\pi i/6}$—aka $6(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6})$
11. $2e^{4\pi i/3}$ —aka $2(\cos\frac{4\pi}{3} + i\sin\frac{4\pi}{3})$
12. $13e^{\pi i/18}$ —aka $13(\cos\frac{1}{18} + i\sin\frac{1}{18})$

**Answers**

1. $6e^{30i}$ or $6e^{\pi i/6}$ 2. $12e^{30i}$ or $12e^{\pi i/6}$
3. $4e^{60i}$ or $4e^{\pi 2i/6}$ 4. $5\sqrt{2}e^{45i}$ or $5\sqrt{2}e^{\pi i/4}$
5. $\approx 5e^{323i}$ or $\approx 5e^{9\pi i/5}$ 6. $\approx 13e^{22.6i}$
7. $\approx 10e^{323.1i}$ 8. $-2\sqrt{2} + 2\sqrt{2}i$
9. $1+\sqrt{3}i$ 10. $3\sqrt{3}+3i$ 11. $-1-\sqrt{3}$
12. $13\cos(10^\circ) + 13\sin(10^\circ)i \approx 12.80 + 2.26i$