MATH 122
SPRING 2024 NAME:
EXAM 4

1. [10 pts.] Solve $y = \tan(2x - 1)$ for $x \in \left(\frac{1}{2} - \frac{\pi}{4}, \frac{1}{2} + \frac{\pi}{4}\right)$.

2. [10 pts.] Radio direction finders are placed at points A and B, which are 7.82 km apart on an east-west line, with A west of B. From A the bearing of a certain radio transmitter is 52.7°, and from B the bearing is 291.3°. Find the distance the transmitter is from A.

3. [10 pts.] Solve the triangle ABC, given $A = 61.7°$, $a = 78.9$ m, and $b = 86.4$ m.

4. [10 pts.] A parallelogram has sides of length 25.9 cm and 32.5 cm. The longer diagonal has length 57.8 cm. Find the measure of the angle opposite the longer diagonal.

5. [10 pts.] Write $6 \operatorname{cis} 135°$ in rectangular form.

6. [10 pts.] Write $\sqrt{3} - i$ in trigonometric (polar) form $r(\cos\theta + i\sin\theta)$, with $\theta \in [0°, 360°)$.

7. [10 pts.] Write $2 + 7i$ in trigonometric form, expressing angles in degrees to two decimal places.

8. [10 pts.] Find the product $\left(\sqrt{6} \operatorname{cis} 120°\right)\left[\sqrt{6} \operatorname{cis}(-30°)\right]$. Write the answer in rectangular form.

9. [10 pts.] Find the quotient $\dfrac{3 \operatorname{cis} 305°}{9 \operatorname{cis} 65°}$. Write the answer in rectangular form.

10. [10 pts.] Find the power $(-1 + i)^7$. Write the answer in rectangular form.

11. [10 pts.] Find all complex number solutions to the equation $z^3 + i = 0$. Write the answer in trigonometric form.

Trigonometric Identities

$$\cos(\alpha \pm \beta) = \cos\alpha\cos\beta \mp \sin\alpha\sin\beta$$

$$\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$$

$$\tan(\alpha \pm \beta) = \frac{\tan\alpha \pm \tan\beta}{1 \mp \tan\alpha\tan\beta}.$$

$$\cos 2\theta = \cos^2\theta - \sin^2\theta.$$

$$\sin 2\theta = 2\sin\theta\cos\theta.$$

$$\tan 2\theta = \frac{2\tan\theta}{1 - \tan^2\theta}.$$

$$\cos\frac{\theta}{2} = \pm\sqrt{\frac{1+\cos\theta}{2}}.$$

$$\sin\frac{\theta}{2} = \pm\sqrt{\frac{1-\cos\theta}{2}}.$$

$$\tan\frac{\theta}{2} = \pm\sqrt{\frac{1-\cos\theta}{1+\cos\theta}} = \frac{\sin\theta}{1+\cos\theta} = \frac{1-\cos\theta}{\sin\theta}.$$

$$\cos(90^\circ - \theta) = \sin\theta$$

$$\sin(90^\circ - \theta) = \cos\theta$$

$$\tan(90^\circ - \theta) = \cot\theta$$