

# Math 110 Common Exam #3

November 20, 2024

**Time:** 1 hour and 25 minutes

**Instructions:** Show all work for full credit.  
No outside materials or calculators allowed.

**Extra Space:** Use the backs of each sheet  
for extra space. Clearly label when doing so.

**Name:** \_\_\_\_\_

**ID #:** \_\_\_\_\_

**Instructor/Section:** \_\_\_\_\_

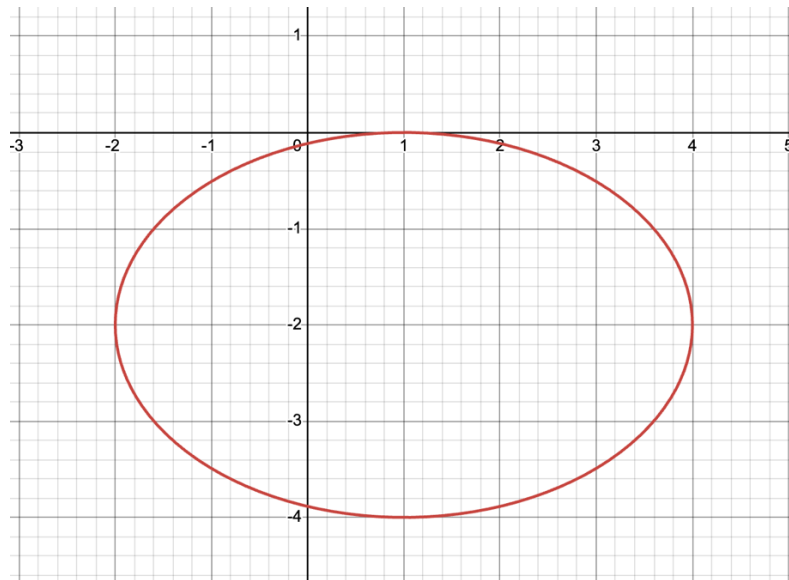
*“I pledge by my honor that I have abided by the  
NJIT Academic Integrity Code.”*

\_\_\_\_\_ (Signature)

Problem	Score
1	
2	
3	
4	
5	
6	
7	
8	
9	

1. Find the exact value of  $\cos(157.5^\circ)$  (6 pts)

2. Find the standard form of the equation for the ellipse below: (6 pts)



3. Given that  $\sin\theta = -\frac{9}{41}$ ,  $\theta$  in Q3, find the exact value of: (18 points total)

a.  $\tan 2\theta$

b.  $\cos 2\theta$

c. What quadrant is  $2\theta$  located in? Give justification for your answer.

4. Solve the following equations for all possible solutions: (5 pts each)

a.  $\frac{-2-\sqrt{3}}{2} = -1 + \cos x$

b.  $\cos\left(2x - \frac{\pi}{4}\right) = -\frac{\sqrt{2}}{2}$

c.  $\cos^2 x + 4 = 2\sin x - 3$

d.  $\sin(e^x) = 1$

5. Verify the following identity:  $\left(\cos\frac{x}{2} + \sin\frac{x}{2}\right)^2 = 1 + \sin x$ . (6 pts)

6. True/False (no work needed) (3 pts each)

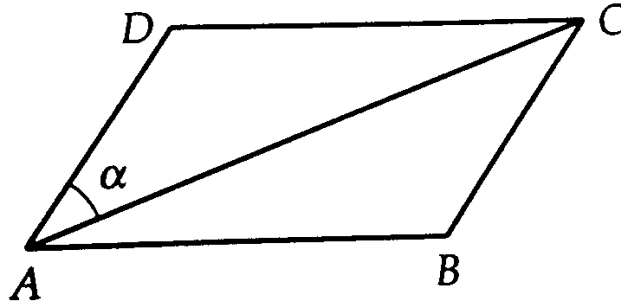
a. Solving a SSA triangle using Law of Sines or Law of Cosines can only result in 0 or 1 solution

b. Heron's Formula can be used to solve a triangle with given angles, A, B, and C

c. A bearing of  $S 35^\circ E$  is in quadrant 3

d. In the equation for half angle of cosine,  $\cos\frac{\theta}{2} = \pm\sqrt{\frac{1+\cos\theta}{2}}$ , the decision between  $+$  or  $-$  depends on the quadrant in which  $\frac{\theta}{2}$  lies.

7. The longer side of the parallelogram below has a measure of 6 units. The measure of angle BAD is  $56^\circ$ , and  $\alpha = 35^\circ$ . Find the length of the longer diagonal. (6 pts)



8. Find the general form of the equation of a circle that has center  $(-4, -2)$  and contains the point  $(1, -2)$  on the edge. (6 pts)

9. Solve the following equations for all solutions within the interval  $0 \leq x < 2\pi$ . (5 pts each)

a.  $\sin 3x - \sin x = 0$

b.  $2 - 3\sec\theta = -2\sec\theta$

c.  $2 - 6 \tan\left(\theta + \frac{4\pi}{3}\right) = -3\sqrt{3} + 2 + 3 \tan\left(\theta + \frac{4\pi}{3}\right)$

d.  $2\sin x \cos x - \cos x = 0$