



# Math 1060 Final Exam Part 1 of 2

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

100

Math Department

Instructor: \_\_\_\_\_

Answer all of questions 1-10. No books, notes, cell phones, calculators or any other electronic devices are allowed. Write down all necessary steps and answers legibly to earn full credit. Students are not allowed to have Part 1 back after submitting it. Do it by yourself.

1. Find the exact value of each of the following or state that it is undefined.

a)  $\cos\left(\frac{2\pi}{3}\right) =$

b)  $\sin\left(-\frac{15\pi}{4}\right) =$

c)  $\cot\left(\frac{\pi}{3}\right) =$

2. Find the exact value of each of the following or state that it is undefined.

a)  $\tan(30^\circ) =$

b)  $\sec(-45^\circ) =$

c)  $\csc(-60^\circ) =$

3. Find an equivalent algebraic expression for the composition.  $\tan(\arcsin(x))$

4. Consider the function  $y = -3 \cos\left(\frac{\pi x}{2} + \frac{\pi}{2}\right) - 1$ .

a) Find the phase shift.

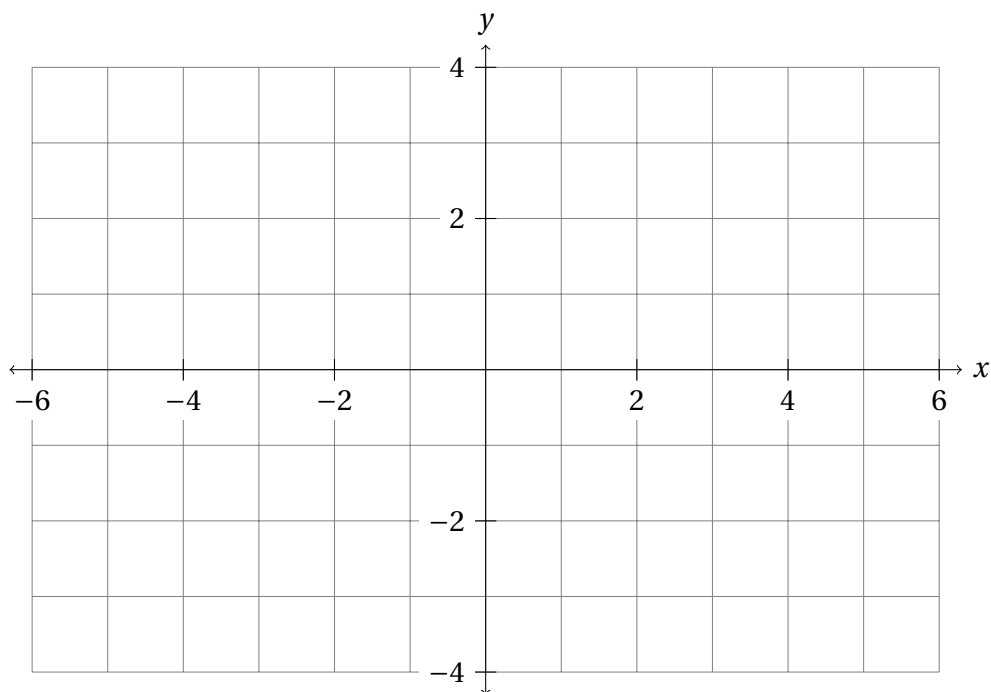
b) Find the period.

c) Find the frequency.

d) Find the amplitude.

e) Find the range.

f) Graph at least one period of the function and give the exact coordinates of the five key points on the graph.



5. a) Complete the formula.  $\tan(\alpha + \beta) =$

b) Use the formula from a) to find the exact value of  $\tan(75^\circ)$ .

6. Suppose  $\sec(\theta) = -4$  with  $\theta$  in Quadrant II. Find the exact values of the remaining circular functions of  $\theta$ .

a)  $\cos(\theta) =$

d)  $\csc(\theta) =$

b)  $\sin(\theta) =$

e)  $\cot(\theta) =$

c)  $\tan(\theta) =$

7. Use the vectors  $\vec{u} = \langle 10, -5 \rangle$  and  $\vec{v} = \langle -2, 4 \rangle$  and write answers in the form  $\langle a, b \rangle$ .

a) Find  $\vec{u} - 2\vec{v}$ .

b) Find  $\|\vec{v}\|$ .

c) Are the vectors  $\vec{u}$  and  $\vec{v}$  orthogonal (perpendicular)? Provide a numerical justification.

8. Evaluate each expression.

a)  $\arccos(\cos(245^\circ))$

b)  $\sin\left(\arccos\left(-\frac{1}{2}\right)\right)$

9. Find all of the exact solutions in radians of the equation.  $\sec^2(x) = \frac{4}{3}$

10. Prove that the equation is an identity. Assume that all quantities are defined.

$$\cos(3\theta) = 2\cos^3(\theta) - \cos(\theta) - 2\sin^2(\theta)\cos(\theta)$$

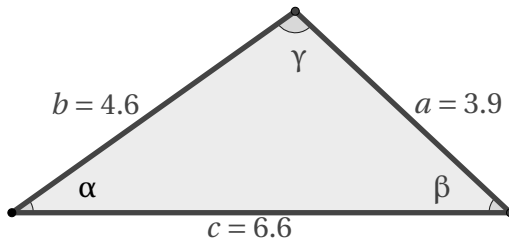
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Answer all of questions 11-20. Students must submit Part 1 before starting Part 2. You may use scientific or approved graphing calculators. No books, notes, cell phones, or any other electronic devices are allowed. Write down all necessary steps and answers legibly to earn full credit. Do it by yourself.

11. Solve the triangle. Round answers to the nearest hundredth of a degree.

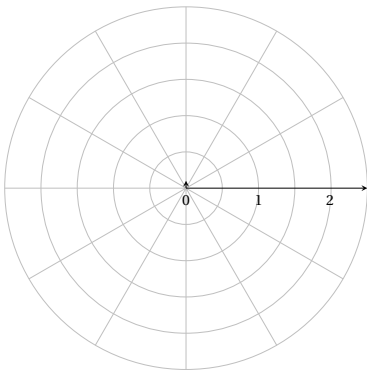


12. Find the area of a triangle with the lengths of the sides 4.6 m, 3.9 m, and 6.6 m. Round your answer to the nearest hundredth.

13. Find all of the third roots of  $2i$ . Write your answers as  $r(\cos\theta + i\sin\theta)$ .

14. An old computer hard drive contains a circular disk with diameter 2.5 inches and spins at a rate of 3,500 revolutions per minute. Find the linear speed of a point on the edge of the disk in miles per hour. Round your answer to two decimal places. (1 mile = 5,280 feet)

15. Graph the polar equation  $r = 2 \cos(2\theta)$ . State at least four exact  $(r, \theta)$  points on the graph.



16. Divide and give the answer in the form  $a + bi$ . Round  $a$  and  $b$  to 3 decimal places.

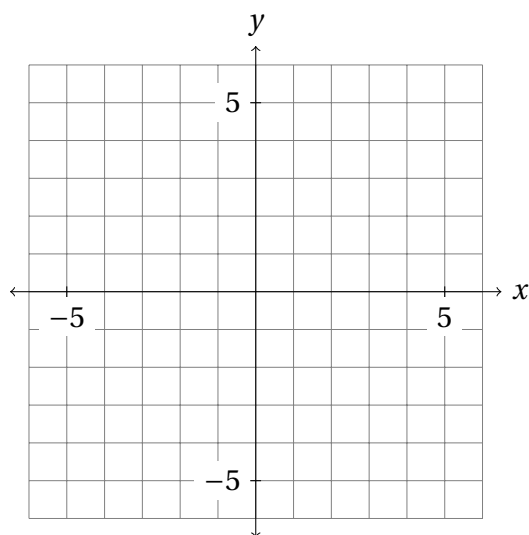
$$\frac{4(\cos(32^\circ) + i \sin(32^\circ))}{6(\cos(61^\circ) + i \sin(61^\circ))}$$

17. Solve for the remaining side(s) and angle(s) if possible. Assume  $(\alpha, a)$ ,  $(\beta, b)$  and  $(\gamma, c)$  are angle-side opposite pairs. Round your answer to the nearest tenth.

$$b = 9, c = 8, \gamma = 40^\circ$$

18. Plot the set of parametric equations. Be sure to indicate the orientation imparted on the curve by the parametrization.

$$\begin{cases} x = \frac{1}{2}t^2 - 1 \\ y = 4 - 3t \end{cases} \text{ for } 0 \leq t \leq 3$$



19. A plane leaves an airport with an airspeed of 130 miles per hour with bearing  $S28^\circ E$ . A 35 mile per hour wind is blowing at a bearing of  $N15^\circ E$ . Find the true speed of the plane, rounded to the nearest mile per hour, and the true bearing of the plane, rounded to the nearest degree.

20. A guy wire 800 feet long is attached to the top of a tower. When pulled taut it makes a  $27^\circ$  angle with the ground. How tall is the tower? Round your answer to the nearest foot.