# MAC 1147
## Fall 2019

# EXAM 4A

A. Sign and date your scantron on the back at the bottom.

B. In pencil, write and encode in the spaces indicated on your scantron:

   1) Name (last name, first initial, middle initial)

   2) UF ID Number

   3) Section Number — Do not fill this out.

C. Under "special codes" on your scantron, code in the test ID number 4, 1.

   1   2   3   ●   5   6   7   8   9   0

   ●   2   3   4   5   6   7   8   9   0

D. At the top right of your scantron, for "Test Form Code", encode A.

   ●   B   C   D   E

E.   1) There are eighteen 4-point multiple-choice questions and two 4-point free response questions, for a total of 80 points.

   2) The time allowed is 90 minutes.

   3) You may write on the test.

   4) Raise your hand if you need more scratch paper or if you have a problem with your test. DO NOT LEAVE YOUR SEAT UNLESS YOU ARE FINISHED WITH THE TEST.

F. **KEEP YOUR SCANTRON COVERED AT ALL TIMES.**

G. When you are finished:

   1) Before turning in your test, check for transcribing errors. Any mistakes you leave in are there to stay.

   2) Take your test, scratch paper, and scantron to your TA. Be prepared to show your UF ID card.

   3) Answers will be posted in E-Learning after the exam.

H. By taking this exam, you agree to the following **Honor Pledge:**

   **"I will neither give nor receive any unauthorized aid for this exam."**

Questions 1–20 are worth 4 points each.

1. Identify the function $f(x)$ graphed below:
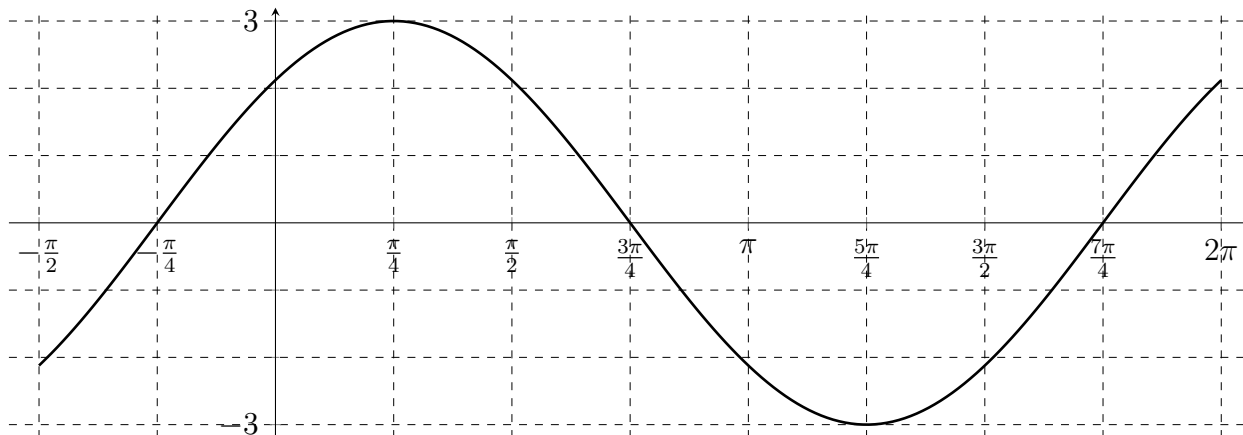


A. $f(x) = 3\cos x - \frac{\pi}{4}$

B. $f(x) = \cos\left(3x - \frac{\pi}{4}\right)$

C. $f(x) = 3\cos\left(x - \frac{\pi}{4}\right)$

D. $f(x) = \cos 3x - \frac{\pi}{4}$

E. $f(x) = 3\cos x$

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2. Let $f(x) = 2\csc\left(x + \frac{\pi}{4}\right)$. Which of the following statements are true?

   I. $f(x)$ is odd.

   II. The line $y = -2$ and $f(x)$ intersect at $x = \dfrac{5\pi}{4}$.

   III. $y = 0$ is a horizontal asymptote of $f(x)$.

   IV. $f(x)$ has exactly one vertical asymptote.

A. II only

B. IV only

C. II, III, IV only

D. I and II only

E. I, II, III only

3. An angle $\theta$ in standard position has the point $(5, -6)$ on its terminal side. What is $\sin \theta$?

A. $\dfrac{-6}{5}$
B. $\dfrac{5}{61}$
C. $\dfrac{-6}{61}$
D. $\dfrac{5}{\sqrt{61}}$
E. $\dfrac{-6}{\sqrt{61}}$

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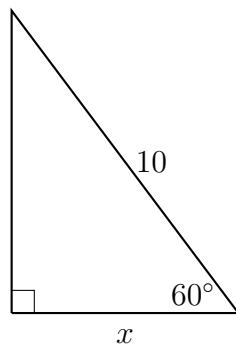4. Select the *false* statement.

A. The domain of $h(x) = \arcsin(x)$ is $[-1, 1]$.

B. For any value of $a$, if $\sin a = b$ then $\arcsin b = a$.

C. The function $g(x) = \tan(x)$ is one-to-one on the interval $\left(-\dfrac{\pi}{2}, \dfrac{\pi}{2}\right)$.

D. $\arccos(-1) = \pi$

E. $f(x) = \cos(x)$ is *not* one-to-one on the interval $[0, 2\pi)$.

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5. Put the following values in order from lowest to highest:

$$\sin\left(\tfrac{\pi}{3}\right), \cos\left(-\tfrac{\pi}{3}\right), \cos(0), \sin(3\pi)$$

A. $\sin(3\pi) < \cos\left(-\tfrac{\pi}{3}\right) < \sin\left(\tfrac{\pi}{3}\right) < \cos(0)$

B. $\cos\left(-\tfrac{\pi}{3}\right) < \sin(3\pi) < \sin\left(\tfrac{\pi}{3}\right) < \cos(0)$

C. $\sin\left(\tfrac{\pi}{3}\right) < \cos(0) < \sin(3\pi) < \cos\left(-\tfrac{\pi}{3}\right)$

D. $\cos(0) < \sin\left(\tfrac{\pi}{3}\right) < \cos\left(-\tfrac{\pi}{3}\right) < \sin(3\pi)$

E. $\sin\left(\tfrac{\pi}{3}\right) < \cos\left(-\tfrac{\pi}{3}\right) < \sin(3\pi) < \cos(0)$

6. Consult the diagram below and determine the exact value of $x$:



A. $5\sqrt{3}$        B. $\frac{\sqrt{3}}{2}$        C. $5$        D. $\frac{1}{2}$        E. $10$

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7. Evaluate $\arcsin\left(\dfrac{\pi}{2}\right)$.
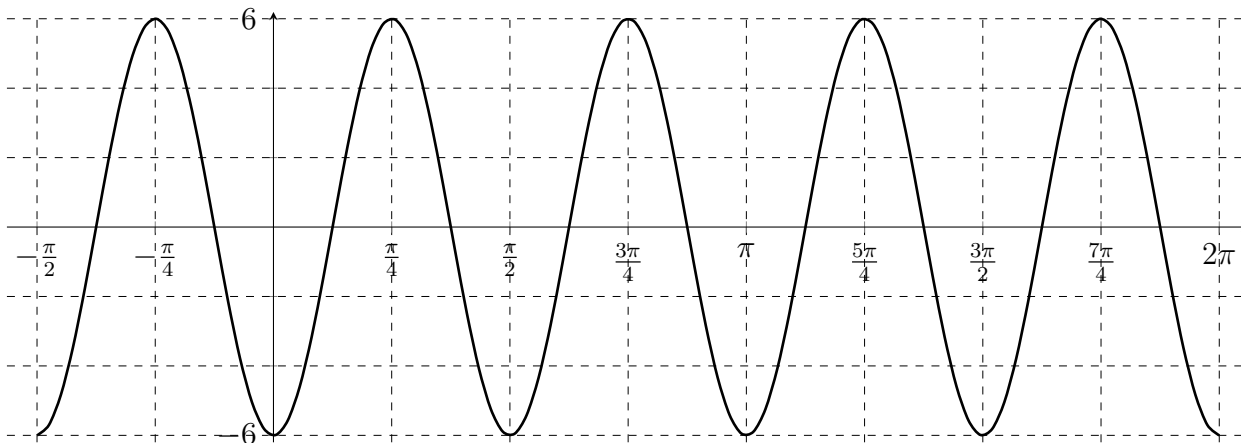
A. $0$        B. $\dfrac{1}{2}$        C. $1$

D. $\dfrac{\sqrt{3}}{2}$        E. Does not exist.

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8. Simplify and choose the equivalent expression.
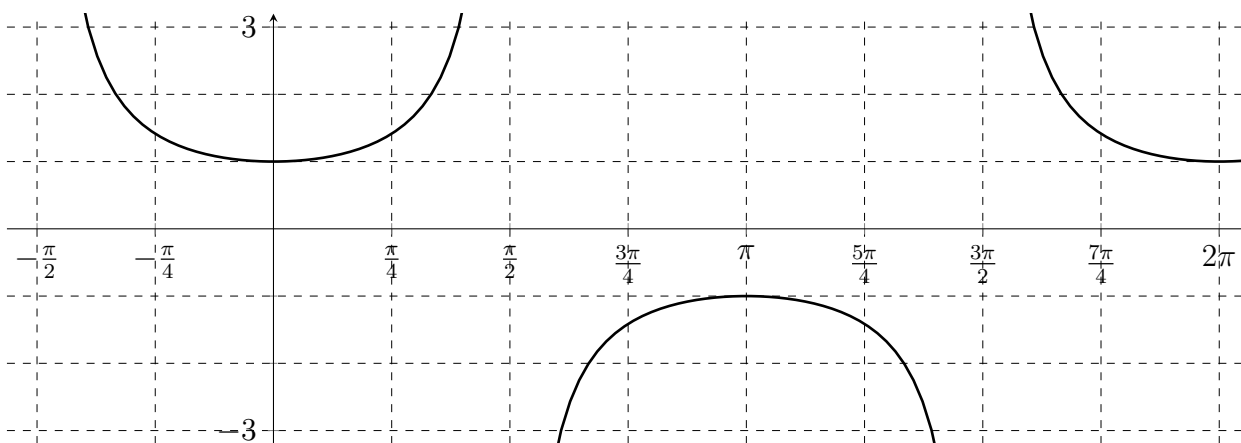
$$\frac{\csc x}{\sin x} - \frac{\cot x}{\tan x}$$

A. $\csc x - \cot x$        B. $\sin^2 x \sec x$        C. $\csc^2 x$

D. $-1$        E. $1$

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9. The function $f(x) = a\cos(bx - c) + d$ is graphed below. If $a > 0$, what is its phase shift?



A. 0    B. $-\pi$    C. $\dfrac{\pi}{6}$    D. $\pi$    E. $\dfrac{\pi}{4}$

10. Identify the trigonometric function graphed below.



A. $\cos x$    B. $\sin x$    C. $\tan x$    D. $\sec x$    E. $\csc x$

11.  Evaluate: $\arccos\left(\cos\left(\dfrac{4\pi}{3}\right)\right)$

A. 0          B. $\dfrac{\pi}{3}$          C. $\dfrac{2\pi}{3}$          D. $\pi$          E. $\dfrac{4\pi}{3}$

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12.  Let $f(x) = 5\cos\left(\dfrac{\pi}{2}x\right)$ for $-1 \le x \le 11$. If $n$ is the number of times $f(x)$ attains its maximum value on the given interval and $m$ is the number of times $f(x)$ attains its minimum value on the given interval, find $n + m$.

A. 4          B. 5          C. 6          D. 7          E. 8

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13.  Identify the expression that is _not_ equivalent to the other four.

A. $\cos^2\theta$          B. $\dfrac{\sin^2\theta}{\tan^2\theta}$          C. $1 - \sin^2\theta$

D. $\tan^2\theta \cdot \cos^2\theta$          E. $\cot^2\theta \cdot \sin^2\theta$

14. An angle $\theta$ has $\tan\theta < 0$ and $\cos\theta > 0$. In which quadrant does $\theta$ lie when in standard position?

    A. I          B. II          C. III          D. IV          E. Um, V?

15. How many solutions does the equation $\sin(x) = \dfrac{\sqrt{5}}{10}$ have? Choose the correct statement.

    A. One solution, given by $\arcsin\left(\frac{\sqrt{5}}{10}\right)$.

    B. None, since $\frac{\sqrt{5}}{10}$ is not on the unit circle.

    C. Infinitely many, since $\sin(x)$ is periodic.

    D. Two, given by $\arcsin\left(\pm\frac{\sqrt{5}}{10}\right)$ since $\sin(x)$ is an odd function.

    E. Four, given by $\pm\arcsin\left(\pm\frac{\sqrt{5}}{10}\right)$ since $\sin(x)$ is an odd function.

16. Suppose that $\csc x = 4$ and that $\cot x > 0$. What is the value of $\cos x$?

    A. $\dfrac{1}{\sqrt{15}}$          B. $\dfrac{1}{4}$          C. $\dfrac{\sqrt{15}}{4}$          D. $\sqrt{15}$          E. $\dfrac{4}{\sqrt{15}}$

17. Identify the vertical asymptotes of the function $f(x) = \tan\left(x - \dfrac{\pi}{7}\right)$.

    A. $x = \dfrac{9\pi}{14} + n\pi$, where $n$ is an integer

    B. $x = \dfrac{9\pi}{14} + 2n\pi$, where $n$ is an integer

    C. $x = \dfrac{\pi}{7} + n\pi$, where $n$ is an integer

    D. $x = \dfrac{\pi}{7} + 2n\pi$, where $n$ is an integer

    E. The function does not have any vertical asymptotes.

18. Evaluate: $\cos\dfrac{5\pi}{6}$

    A. $0$                 B. $\dfrac{1}{2}$           C. $\dfrac{\sqrt{3}}{2}$           D. $-\dfrac{1}{2}$           E. $-\dfrac{\sqrt{3}}{2}$

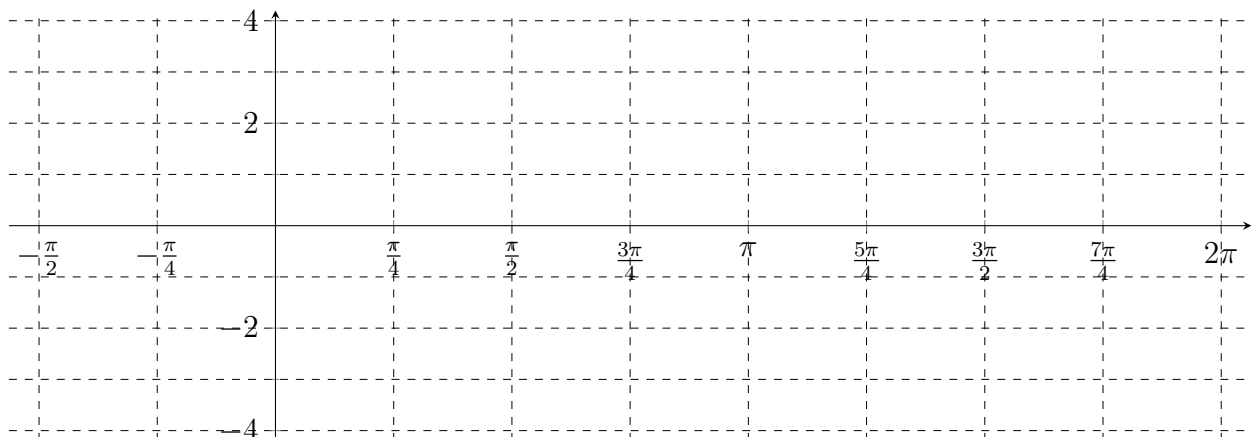## YOU MUST SHOW ALL WORK TO RECEIVE FULL CREDIT.

Free response questions 19–20 are worth 4 points each.

19. Suppose that $f(x) = -3\cos(2x - \pi)$.

    a. The amplitude of $f(x)$ is _____.

    b. The period of $f(x)$ is _____.

    c. The phase shift of $f(x)$ is _____.

    d. Give the coordinates of two $x$-intercepts of $f(x)$

    Coordinates:_____

    e. Sketch the graph of $f(x)$ on the axes below. Include at least two full periods.

20. You are standing on the edge of a river. On the other side is a radio tower. You look up at the top of the tower, and note the angle of elevation is 60°. You then walk directly away from the tower a distance of 200 feet and note the new angle of elevation to the top of the tower is 30°.

a. Draw a picture of the situation. Include both angles given above and the distance walked. Label the width of the river as $x$ and the height of the tower as $h$.

River

●                                              ●

2nd Position                                   1st Position
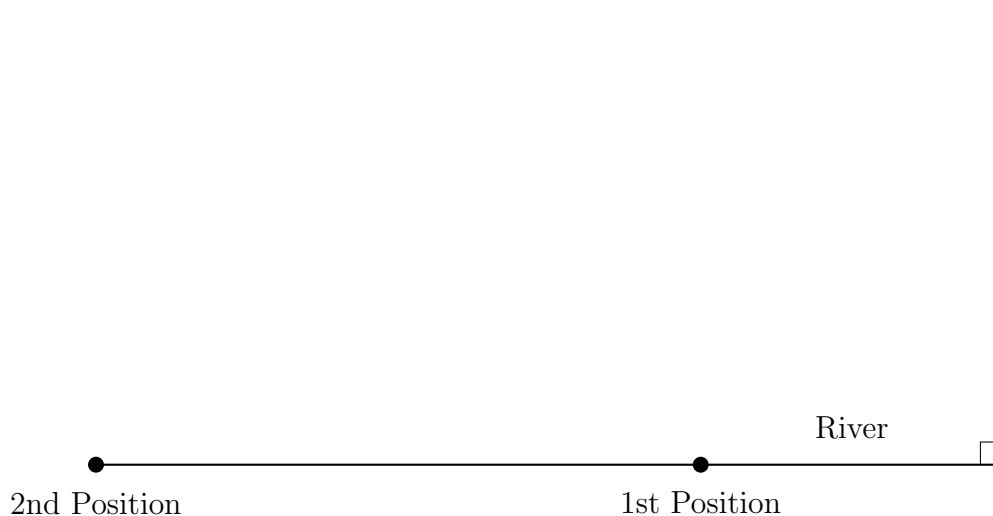
b. Construct two equations involving $x$ and $h$ using trigonometric functions.

c. Solve the system you created and state the height of the radio tower in feet. Leave your answer in radical form.

Tower height:_____ feet

Turn in your scantron and your free response to your TA. The worked-out solutions will be posted on Canvas after the test.