WRITE ALL YOUR RESPONSES ON YOUR ANSWER SHEETS.
A) FOR THE **MULTIPLE CHOICE** ITEMS, YOU DO NOT NEED TO SHOW YOUR WORK, **USE ONLY**
        CAPITAL LETTERS AND YOU DO NOT NEED TO PUT A BOX AROUND YOUR FINAL RESULT.
B) FOR THE **SHORT ANSWER** ITEMS, YOU DO NOT NEED TO SHOW YOUR WORK, AND YOU DO NOT
        NEED TO PUT A BOX AROUND YOUR FINAL RESULT.
C) FOR THE **FREE RESPONSE** ITEMS, SHOW **ALL** YOUR WORK NEATLY.
        USE AS MANY EXTRA SHEETS AS REQUIRED, AND $\boxed{DRAW\ A\ BOX\ AROUND}$ YOUR
        FINAL ANSWER.
D) YOU MAY USE A CALCULATOR, YOUR NOTES, AND THE TEXTBOOK.

YOU MUST SUBMIT PICTURES OF ALL YOUR **ANSWER SHEETS** NO LATER THAN 1:15pm HOUSTON
TIME TODAY. SEND THE PICTURES OF YOUR ANSWER SHEETS AS ATTACHMENTS IN AN EMAIL TO
THE ADDRESS:

                        math1316_11am_spr_21@yahoo.com

NOTE: I WILL BE LESS FORGIVING OF LATE SUBMISSIONS THAN I WAS ON EXAM I.

THERE ARE TWENTY-NINE (29) TOTAL ITEMS ON THE EXAM.

I. MULTIPLE CHOICE: WRITE YOUR RESPONSE IN THE SPACE ON THE ANSWER SHEET.
USE ONLY CAPITAL LETTERS.

1. WHAT IS THE AMPLITUDE OF THE GRAPH OF THE FUNCTION $f(x) = 4\cos(3x)$
A. $|0|$ B. $|1|$ C. $|3|$ D. $|4|$ E. NONE OF THESE

2. WHEN THE FUNCTION $f(x) = \cos(x)$ IS GRAPHED ON THE INTERVAL $(-\infty, \infty)$ WHAT ARE
THE $y -$ COORDINATES OF THE "TROUGH" VALUES OF THIS GRAPH?
A. $y = 0$ B. $y = -1$ C. $y = 1$ D. $y = -2$ E. NONE OF THESE

3. WHAT IS THE DOMAIN OF THE FUNCTION $f(x) = 2\sin(x)$?
A. $(-\infty, \infty)$ B. $[-2, 2]$ C. $[0, \infty)$ D. $\mathbb{R} - \left\{ \pm \frac{\pi}{2} \right\}$ E. NONE OF THESE

4. WHAT IS THE RANGE OF THE FUNCTION $f(x) = 2\sin(x)$?
A. $(-\infty, \infty)$ B. $[-2, 2]$ C. $[0, \infty)$ D. IT HAS NO RANGE   E. NONE OF THESE

5. WHICH OF THE FOLLOWING IS CORRECT?
A. $r = s\theta$ WHERE θ IS MEASURED IN RADIANS   B. $\theta = rs$ WHERE θ IS MEASURED IN DEGREES
C. $s = r\theta$ WHERE θ IS MEASURED IN DEGREES   D. $s = r\theta$ WHERE θ IS MEASURED IN RADIANS
E. NONE OF THESE

6. FOR WHICH PAIR OF FUNCTIONS IS THE RANGE OF $f(x)$ THE SAME AS THE RANGE OF $g(x)$?
A. $f(x) = \sin(x)$ & $g(x) = \csc(x)$ B. $f(x) = \csc(x)$ & $g(x) = \sec(x)$
C. $f(x) = \cot(x)$ & $g(x) = \cos(x)$ D. $f(x) = \cos(x)$ & $g(x) = \sec(x)$
E. NONE OF THESE

7. WHAT IS THE PERIOD OF THE FUNCTION $f(x) = 2\sin(x)$?

A. π B. 4 C. 2 D. 2π E. NONE OF THESE

8. WHAT IS THE PERIOD OF THE FUNCTION $f(x) = 2\sin(x)$?

A. π B. 4 C. 2 D. 2π E. NONE OF THESE
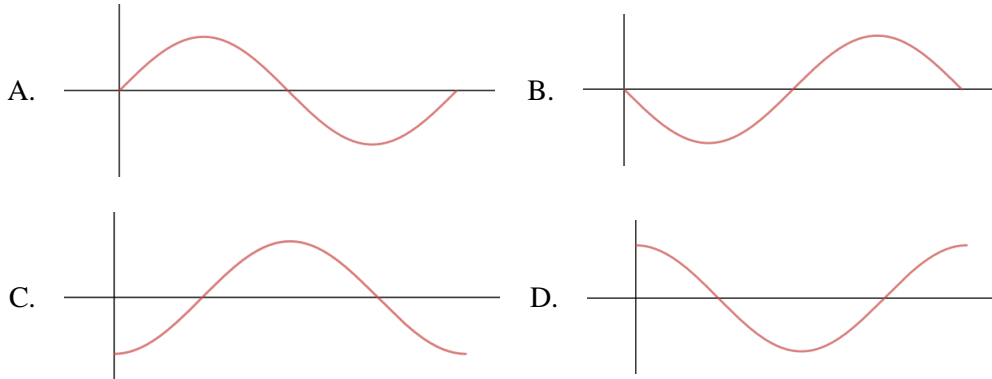
9. WHAT IS THE PERIOD OF THE FUNCTION $f(x) = \sec(2x)$?

A. $\pi/4$ B. $\pi/2$ C. π D. 2π E. NONE OF THESE

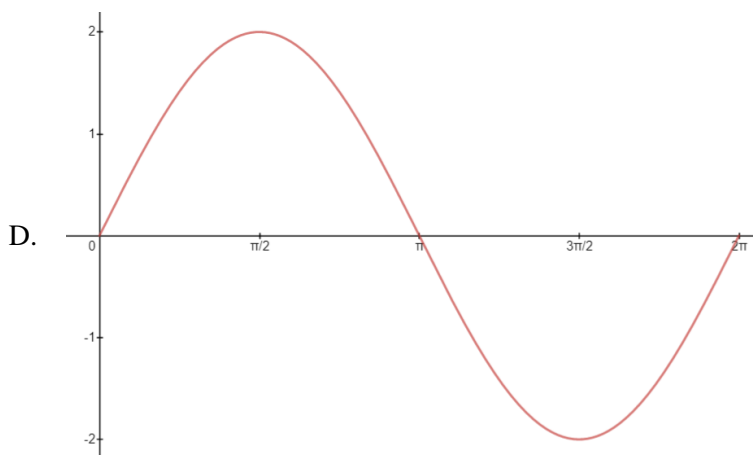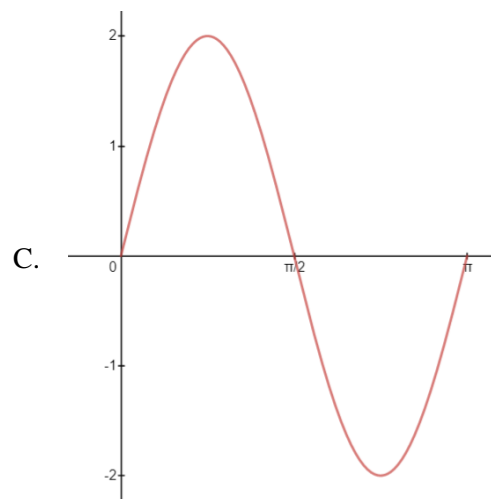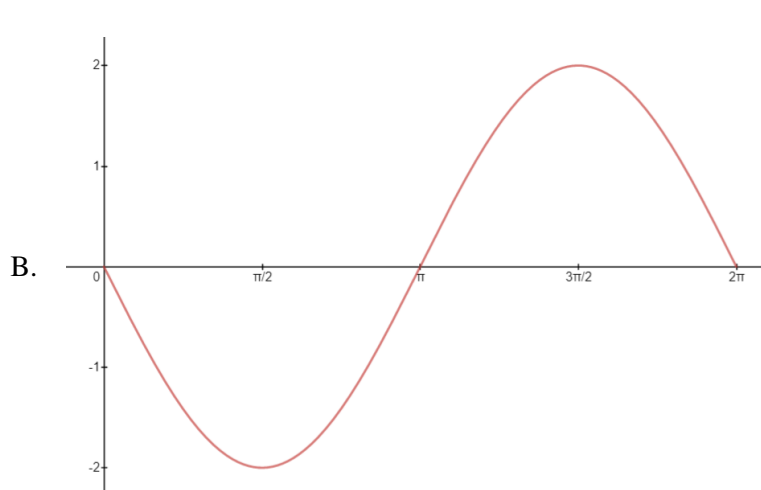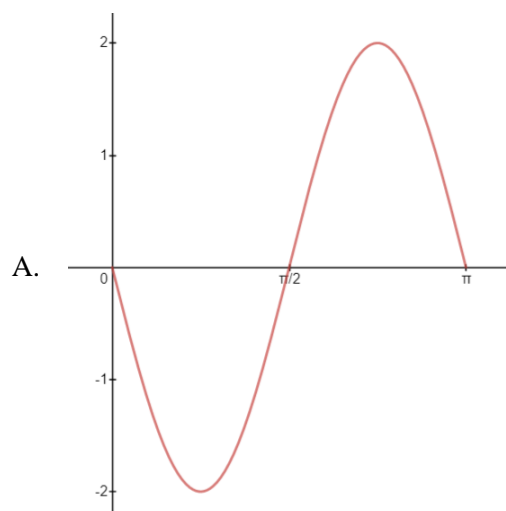10. WHAT IS THE AMPLITUDE OF THE GRAPH OF THE FUNCTION $f(x) = -3\sin(-2x)$

A. $|-3|$ B. -3 C. $|-2|$ D. -2 E. NONE OF THESE

11. WHAT IS A SKETCH OF ONE PERIOD OF THE GRAPH OF THE FUNCTION $f(x) = -\cos(x)$?
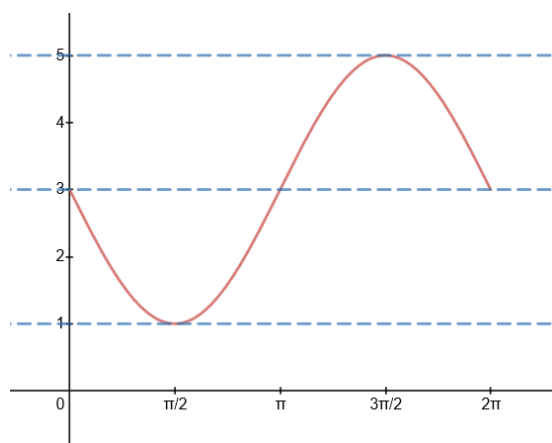
A.   B.

C.   D.

E. NONE OF THESE

12. WHAT IS A SKETCH OF ONE PERIOD OF THE GRAPH OF THE FUNCTION $f(x) = -2\sin(x)$?

A.

B.

C.

D.

E. NONE OF THESE

13. THIS IS THE GRAPH OF WHICH OF THE FOLLOWING FUNCTIONS?
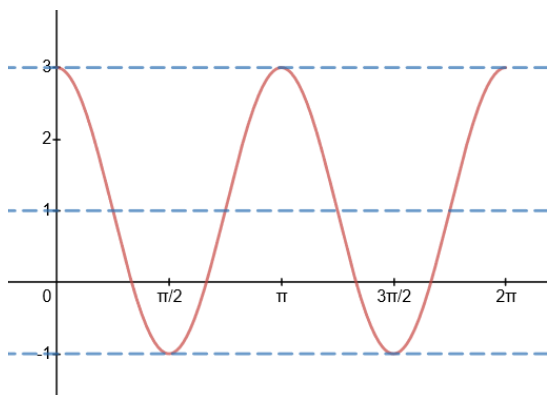
A. $f(x) = -3\sin(x)$ B. $f(x) = 3\sin(x) + 2$
C. $f(x) = -2\sin(x) + 3$ D. $f(x) = -3\sin(x) + 2$
E. NONE OF THESE

14. THIS IS THE GRAPH OF WHICH OF THE FOLLOWING FUNCTIONS?

A. $f(x) = 2\sin(x) + 1$ B. $f(x) = 2\sin(2x) + 1$
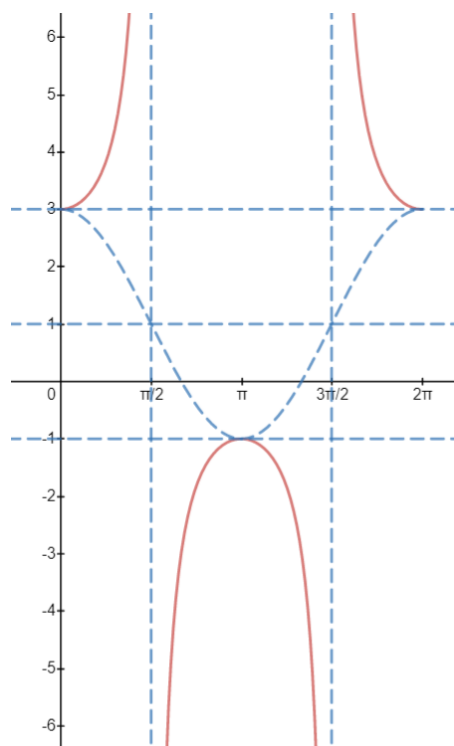C. $f(x) = -2\cos(2x) + 1$ D. $f(x) = 2\cos(2x) + 1$
E. NONE OF THESE

15. FOR WHICH FUNCTION OR FUNCTIONS ARE THE VERTICAL ASYMPTOTES LOCATED AT ALL ODD VALURS OF $\frac{\pi}{2}$?

A. $f(x) = \csc(x)$ B. BOTH $f(x) = \csc(x)$ AND $g(x) = \sec(x)$
C. $g(x) = \sec(x)$ D. NEITHER $f(x) = \csc(x)$ NOR $g(x) = \sec(x)$
E. NONE OF THESE

16. WHICH OF THESE FUNCTIONS HAS VERTICAL ASYMPTOTES AT ALL INTEGER MULTIPLES OF π ?
A. $f(x) = \cos(x)$ B. $f(x) = \tan(x)$ C. $f(x) = \csc(x)$ D. $f(x) = \sec(x)$
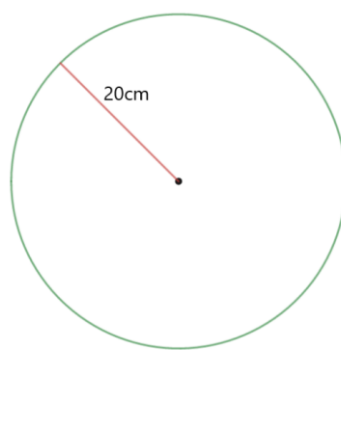E. NONE OF THESE

17. THIS IS THE GRAPH OF WHICH OF THE FOLLOWING FUNCTIONS?

A. $f(x) = -2\sec(2x) + 1$ B. $f(x) = 2\sec(2x) + 1$
C. $f(x) = 2\sec(x) + 1$ D. $f(x) = -2\sec(x) + 1$
E. NONE OF THESE

18. SEE PICTURE. IF THE GEAR (GREEN), WITH RADIUS OF $20cm$ ROTATES COUNTER-CLOCKWISE THROUGH AN ANGLE OF $\pi/4$ RADIANS, WHAT IS THE LENGTH OF THE ROPE (PURPLE) WHICH FEEDS INTO THE GEAR?

20cm

A. $20cm$　　B. $20\pi cm$　　C. $5cm$　　D. $5\pi cm$　　E. NONE OF THESE

19. SEE PICTURE. TWO GEARS ARE FIXED SO THAT AS THE SMALLER BLUE GEAR (G_1) ROTATES CLOCKWISE, PULLING UP THE ORANGE ROPE, THE LARGER GREEN GEAR (G_2) ROTATES COUNTER-CLOCKWISE, PULLING UP THE PURPLE ROPE. SUPPOSE G_1 ROTATES THROUGH A CERTAIN ANGLE, θ_1 . IF WE ASSUME THE RADII OF THE GEARS ARE DIFFERENT, WHICH OF THE FOLLOWING MUST BE TRUE?

G_2

G_1
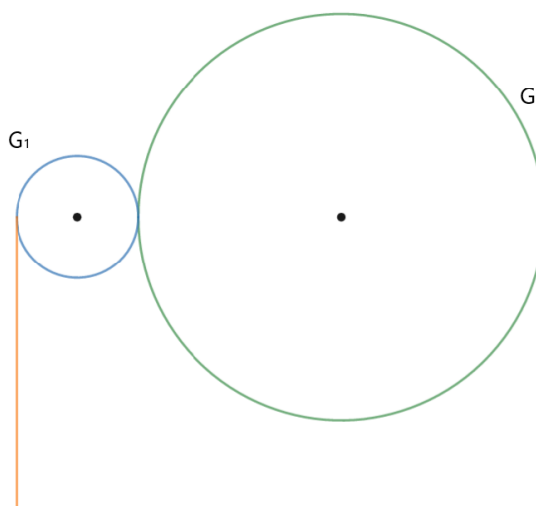
A. BOTH B AND C ARE TRUE.　　B. $s_1 = s_2$　　C. $\theta_1 = \theta_2$
D. NOT ENOUGH INFORMATION IS GIVEN　　E. NONE OF THESE

20. USE THE SAME PICTURE AS ITEM #19, BUT NOW ASSUME $r_1 = 3cm$, $r_2 = 12cm$ AND G_2 ROTATES COUNTER-CLOCKWISE THROUGH AN ANGLE OF $\pi/2$ RADIANS. THROUGH HOW MANY RADIANS WILL G_1 ROTATE?

A. $\pi/2$　　B. π　　C. 2π
D. NOT ENOUGH INFORMATION IS GIVEN　　E. NONE OF THESE

* * *

II. **SHORT ANSWER** ITEMS. FIND THE DERIVATIVE OF EACH FUNCTION. **YOU ARE SPECIFICALLY INSTRUCTED NOT TO SIMPLIFY** YOUR RESULT. YOU NEED ONLY WRITE YOUR FINAL RESULT. DO NOT TRY TO FIT ALL YOUR WORK INTO A SMALL SPACE. MAKE SCERTAIN YOUR WORK IS WRITTEN LARGELY AND NEATLY ENOUGH TO BE READ.

21. WHAT IS THE PERIOD OF THE FUNCTION $f(x) = \sin(2x) + 1$?

22. WHAT IS THE DOMAIN OF THE FUNCTION $f(x) = 2\cos(x)$?

23. WHAT IS THE RANGE OF THE FUNCTION $f(x) = \csc(x) + 2$?

24. IF TWO DIFFERENT SIZED GEARS ARE FIXED WITH THE SAME CENTER, AND THE SMALLER ONE ROTATES THROUGH AN ANGLE OF $\dfrac{4\pi}{3}$ RADIANS THROUGH WHAT ANGLE DOES THE LARGER OF THE TWO GEARS ROTATE?

III. FREE RESPONSE: FOR EACH OF THE FOLLOWING ITEMS YOU MUST SHOW YOUR WORK NEATLY AND COMPLETELY AS DEMONSTRATED IN THE VIDEO LESSONS. YOU **DO NOT NEED TO SIMPLIFY** YOUR FINAL RESULT IN ANY WAY, HOWEVER,
$\boxed{DRAW\ A\ BOX\ AROUND}$ YOUR FINAL ANSWER.
USE AS MANY EXTRA SHEETS AS NEEDED. YOUR WORK MUST BE NEAT, READABLE, AND USE ONLY METHODS DISCUSSED ON THE VIDEO LESSONS.
IMPORTANT: SOME STUDENTS' WRITING ON EXAM I WAS EITHER SO SMALL OR SO FAINT THAT IT WAS A CHALLENGE FOR ME TO READ. I NEEDED TO ASK TWO PEOPLE TO RE-SUBMIT BECAUSE OF IT. IF THAT HAPPENS ON EXAM II, THERE WILL BE A PENALTY.
IF YOU DO NOT SHOW ALL YOUR WORK IN A NEAT AND ORDERLY FASHION, OR IF YOU USE METHODS OTHER THAN THOSE DISCUSSED ON THE VIDEO LESSONS, OR IF YOU DO NOT FOLLOW DIRECTIONS, YOU FORFEIT YOUR CLAIM TO ANY CREDIT.

25. USING THE METHODS DISCUSSED IN THE VIDEO LESSONS, SKETCH ONE PERIOD OF THE GRAPH OF THE FUNCTION $f(x) = -2 - 3\sin(x)$

26. USING THE METHODS DISCUSSED IN THE VIDEO LESSONS, SKETCH ONE PERIOD OF THE GRAPH OF THE FUNCTION $f(x) = 2\cos(2x - \pi)$

27. USING THE METHODS DISCUSSED IN THE VIDEO LESSONS, SKETCH ONE PERIOD OF THE GRAPH OF THE FUNCTION $f(x) = \tfrac{1}{2}\sec(\tfrac{1}{2}x)$

28. IN THE FIGURE BELOW TWO GEARS, G_1, GREEN, AND G_2, PURPLE, TOUCH SO THAT AS ONE TURNS THE OTHER DOES AS WELL. THE RADII ARE $r_1 = 27.7cm$ AND $r_2 = 19.1cm$.
IF G_2 ROTATES THROUGH AN ANGLE OF 240 DEGREES, THROUGH HOW MANY DEGREES DOES G_1 ROTATE? STATE YOUR ANSWER IN DEGREES AND ROUND IT TO ONE DECIMAL PLACE.
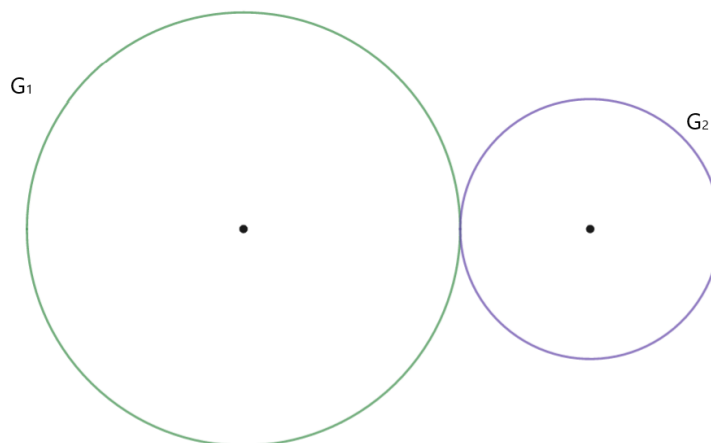
29. IN THE FIGURE BELOW, GEAR NUMBER 1, (G_1 , BLUE) IS TURNED BY THE ORANGE CHAIN. G_1 IS FIXED TO G_2 (GEAR NUMBER 2, GREEN) SO THAT THEY TURN TOGETHER. G_2 TOUCHES G_3 (GEAR NUMBER 3, PURPLE) SO THAT AS G_2 TURNS IT CAUSES G_3 TO TURN. THE RADII OF THE GEARS ARE $r_1 = 13.1cm$, $r_2 = 51.7cm$, AND $r_3 = 29.5cm$.

IF $20cm$ OF THE ORANGE CHAIN FEEDS INTO G_1 THROUGH WHAT ANGLE DOES G_3 ROTATE? EXPRESS YOUR FINAL ANSWER IN DEGREES ROUNDED TO ONE DECIMAL PLACE.
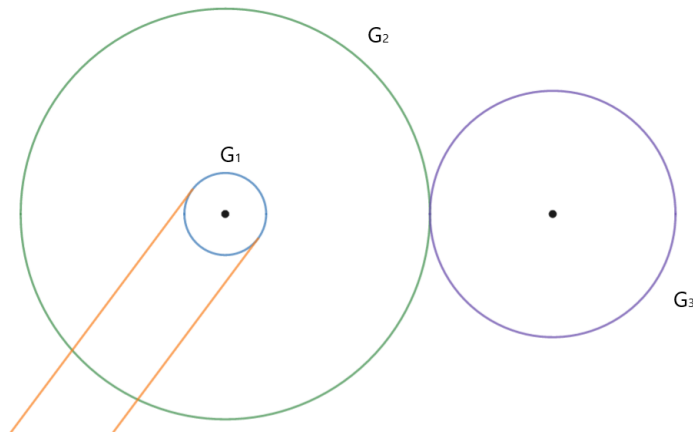
AT THE BOTTOM OF THE LAST PAGES OF YOUR ANSWER SHEETS PRINT NEATLY THE FOLLOWING STATEMENT AND SIGN IT:

"On my honor I have neither given nor received improper assistance on this exam."