

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

**Part I. Multiple Choice**

Worth three points each. Place an X in the box indicating your answer:

1	2	3	4	5	6	7	8	9	10	11	12	13
A	A	A	A	A	A	A	A	A	A	A	A	A
B	B	B	B	B	B	B	B	B	B	B	B	B
C	C	C	C	C	C	C	C	C	C	C	C	C
D	D	D	D	D	D	D	D	D	D	D	D	D
E	E	E	E	E	E	E	E	E	E	E	E	E

1. What are the coordinates of the point on the unit circle on the terminal side of special angle  $\theta = \frac{5\pi}{6}$ ?

- (a)  $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$   
 (b)  $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$   
 (c)  $\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$   
 (d)  $\left(\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$   
 (e) None of these

2. Given  $y = \cos x$ . How does  $y$  vary as  $x$  varies from 0 to  $\frac{\pi}{2}$ ?

- (a)  $y$  varies from 0 to 1  
 (b)  $y$  varies from 0 to  $-1$   
 (c)  $y$  varies from 1 to 0  
 (d)  $y$  varies from  $-1$  to 0  
 (e) None of these

3. Find the exact values of  $x$  in the interval  $0 \leq x \leq 4\pi$  for which  $\sin x = 1$

- (a)  $\left\{\pm\frac{\pi}{2}, \pm\frac{5\pi}{2}\right\}$   
 (b)  $\{0, 2\pi, 4\pi\}$   
 (c)  $\{\pi, 3\pi\}$   
 (d)  $\left\{\frac{\pi}{2}, \frac{5\pi}{2}\right\}$   
 (e) None of these

4. Which of the following equals  $\tan x$ ?

(a)  $\frac{\cos x}{\sin x}$

(b)  $\frac{\sin x}{\cos x}$

(c)  $\frac{1}{\sin x}$

(d)  $\frac{1}{\cos x}$

(e) None of these

5. Which of the following equals  $\tan \frac{7\pi}{4}$ ?

(a) 0

(b) 1

(c)  $-1$

(d)  $\sqrt{3}$

(e) None of these

6. What is the period of the secant function?

(a)  $\pi$

(b)  $\frac{\pi}{2}$

(c)  $2\pi$

(d)  $\infty$

(e) None of these

7. What are the  $x$ -intercepts of  $y = \cos x$  on the interval  $0 \leq x \leq 2\pi$ ?

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

(b)  $\{0, \pi, 2\pi\}$

(c)  $y = \cos x$  has no  $x$ -intercepts on this interval.

(d)  $\left\{\pm \frac{\pi}{2}\right\}$

(e) None of these

8. Which of the six basic trigonometric functions are undefined at  $x = \frac{\pi}{2}$ ?

(a)  $\tan x$ ,  $\sec x$

(b)  $\cot x$ ,  $\csc x$

(c)  $\sin x$ ,  $\cos x$

(d) only  $\cot x$

(e) None of these

9. Describe a shift that will transform the graph of  $y = \cos x$  into the graph of  $y = \sin x$ .
- (a) Shift  $2\pi$  units to the right
  - (b) Shift  $2\pi$  units to the left
  - (c) Shift  $\frac{\pi}{2}$  units to the right
  - (d) Shift  $\frac{\pi}{2}$  units to the left
  - (e) None of these
10. What is the period of  $y = \sin 2x$
- (a)  $\frac{\pi}{2}$
  - (b)  $2\pi$
  - (c)  $\frac{\pi}{4}$
  - (d)  $\pi$
  - (e) None of these
11. What is the phase shift of  $y = \sin(2x - \pi)$ ?
- (a)  $-\pi$
  - (b)  $\frac{\pi}{2}$
  - (c)  $-\frac{\pi}{2}$
  - (d)  $\pi$
  - (e) None of these
12. What is the amplitude of  $-2 \sin\left(\frac{x}{3}\right)$
- (a) 2
  - (b) -2
  - (c) 4
  - (d)  $2/3$
  - (e) None of these
13. What is the reference angle  $\theta_R$  for the angle  $\theta = 410^\circ$ ?
- (a)  $40^\circ$
  - (b)  $50^\circ$
  - (c)  $60^\circ$
  - (d)  $70^\circ$
  - (e) None of these

**Part II. Work-Out**

Show your work on the following problems.

14. (10 pts) Find all solutions of  $\sin x = \frac{1}{2}$  in the interval  $0 \leq x \leq 2\pi$

15. (9 pts) Sketch one cycle of the graph of  $y = \cos x$ .

16. (9 pts) Sketch one cycle of the graph of  $y = \sec x$

17. Which trigonometric functions have vertical asymptotes? Indicate your answer by placing an X in the 'Yes' or 'No' boxes. (2 pts each):

(a)  $y = \sin x$    ☐Yes   ☐No

(b)  $y = \csc x$    ☐Yes   ☐No

(c)  $y = \cos x$    ☐Yes   ☐No

(d)  $y = \tan x$    ☐Yes   ☐No

(e)  $y = \sec x$    ☐Yes   ☐No

(f)  $y = \cot x$    ☐Yes   ☐No

18. Use basic identities to simplify the following (5 pts each):

(a)  $-\sin(x)\sin(-x) + \cos(x)\cos(-x)$

(b)  $\cos(x)\tan(x) + \sin(-x)$

19. (10 pt) Let  $y = 2\sin(2x + 2\pi)$  for  $-\pi \leq x \leq \pi$ . Sketch the graph. Be sure to label the axes. Specify the *amplitude*\_\_\_\_\_, *period*\_\_\_\_\_ and *phase shift*\_\_\_\_\_.

Bonus (10 points): Simplify  $\frac{\csc x + \sec x}{\sin x + \cos x}$