MA 15400

Fall 2014

Exam 2
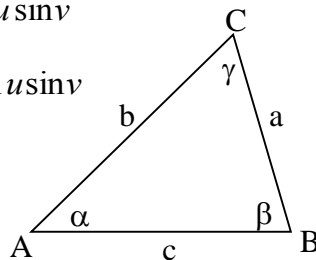
$\sin(u+v) = \sin u \cos v + \cos u \sin v$

$\cos(u+v) = \cos u \cos v - \sin u \sin v$

$\tan(u+v) = \dfrac{\tan u + \tan v}{1 - \tan u \tan v}$

$\sin(u-v) = \sin u \cos v - \cos u \sin v$

$\cos(u-v) = \cos u \cos v + \sin u \sin v$

$\tan(u-v) = \dfrac{\tan u - \tan v}{1 + \tan u \tan v}$

$\sin(2u) = 2 \sin u \cos u$

$\cos(2u) = \cos^2 u - \sin^2 u$

$\tan(2u) = \dfrac{2 \tan u}{1 - \tan^2 u}$

$\sin^2 \theta + \cos^2 \theta = 1$

$1 + \tan^2 \theta = \sec^2 \theta$

$1 + \cot^2 \theta = \csc^2 \theta$

1.   Given $\triangle ABC$ with $\gamma = 90°, \alpha = 30°$, and $b = 15$, find the exact value of side a.

   A. $15\sqrt{3}$

   B. $10\sqrt{3}$

   C. $\dfrac{5}{\sqrt{3}}$

   D. $\dfrac{15}{2}$

   E. $5\sqrt{3}$

2.   Given $\triangle ABC$ with $\gamma = 90°$, angle $\alpha = 21°$, and side $b = 8.6$,
     approximate the perimeter of the triangle to the nearest tenth.

   A. 17.4

   B. 21.1

   C. 19.9

   D. 18.1

   E. 23.6

3.   Given the indicated parts of $\triangle ABC$ with $\gamma = 90°$, express the third part in terms of the first two.

        $a, \beta;\quad c$

   A. $c = a \tan \beta$

   B. $c = a \csc \beta$

   C. $c = a \sec \beta$

   D. $c = a \cos \beta$

   E. $c = a \sin \beta$

4.   From a distance of 1 mile on level ground, a certain tower has an angle of elevation of 8°.
     Determine its height to the nearest foot. (1 mile = 5280 feet)

   A.   742 *feet*

   B.   836 *feet*

   C.   734 *feet*

   D.   826 *feet*

   E.   None of the above

5.   A ladder, 30 feet long, leans against the side of a building, and the angle
     between the ladder and the building is 16°.

     If the distance from the bottom of the ladder to the building is increase by 3.0 feet,
     approximate the angle the ladder now makes with the building to the nearest 0.1°.

   A.   10.1°

   B.   10.5°

   C.   22.1°

   D.   21.7°

   E.   None of the above

Questions 6 and 7.   The following is a love story of two ships that do not pass in the night.

A ship leave port at 2:00 pm and sails in the direction N 41° E at a rate of 37 mph. Another ship leaves the same port at the same time and sails in the direction N 49° W at a rate of 20 mph.

6.   To the nearest whole mile, approximately how far apart are the ships at 6:00 pm?

    A.   136 *miles*

    B.   126 *miles*

    C.   175 *miles*

    D.   168 *miles*

    E.   None of the above

7.   What is the bearing, to the nearest degree, from the first ship to the second?

    A.   *S* 78°*W*

    B.   *S* 66°*W*

    C.   *S* 69°*W*

    D.   *S* 13°*W*

    E.   None of the above

8. Find all solutions of the equation using n as an arbitrary integer.

$$\tan\theta = -\sqrt{3}$$

    A. $\theta = \dfrac{2\pi}{3} + \pi n$

    B. $\theta = \dfrac{\pi}{3} + 2\pi n$

    C. $\theta = \dfrac{2\pi}{3} + 2\pi n$

    D. $\theta = \dfrac{\pi}{3} + \pi n$

    E.   None of the above

9. Find all solutions of the equation using n as an arbitrary integer.

$$\sin(2x) = \dfrac{\sqrt{3}}{2}$$

    A. $\theta = \dfrac{\pi}{8} + \pi n, \dfrac{3\pi}{8} + \pi n$

    B. $\theta = \dfrac{\pi}{6} + \pi n, \dfrac{\pi}{3} + \pi n$

    C. $\theta = \dfrac{2\pi}{3} + \pi n, \dfrac{5\pi}{6} + \pi n$

    D. $\theta = \dfrac{\pi}{6} + \pi n, \dfrac{5\pi}{6} + \pi n$

    E.   None of the above

10. Find all solutions of the equation in the interval $[0, 2\pi)$

$$\cos\left(2x - \frac{\pi}{4}\right) = 0$$

A. $\theta = \dfrac{5\pi}{24}, \dfrac{17\pi}{24}, \dfrac{29\pi}{24}, \dfrac{41\pi}{24}$

B. $\theta = \dfrac{\pi}{8}, \dfrac{5\pi}{8}, \dfrac{9\pi}{8}, \dfrac{13\pi}{8}$

C. $\theta = \dfrac{7\pi}{24}, \dfrac{19\pi}{24}, \dfrac{31\pi}{24}, \dfrac{43\pi}{24}$

D. $\theta = \dfrac{3\pi}{8}, \dfrac{7\pi}{8}, \dfrac{11\pi}{8}, \dfrac{15\pi}{8}$

E. None of the above

11. Find all solutions of the equation in the interval $[0, 2\pi)$

$$2\sin^2\theta - 3\sin\theta + 1 = 0$$

A. $\theta = \dfrac{\pi}{6}, \dfrac{5\pi}{6}, \dfrac{3\pi}{2}$

B. $\theta = \dfrac{7\pi}{6}, \dfrac{11\pi}{6}, \dfrac{\pi}{2}$

C. $\theta = \dfrac{\pi}{6}, \dfrac{5\pi}{6}, \dfrac{\pi}{2}$

D. $\theta = \dfrac{7\pi}{6}, \dfrac{11\pi}{6}, \dfrac{3\pi}{2}$

E. None of the above

12. Express as a trigonometric function of one angle.

$$\sin(35°)\cos(15°) - \cos(35°)\sin(15°)$$

   A. $\cos(50°)$

   B. $\sin(20°)$

   C. $\cos(20°)$

   D. $\sin(50°)$

   E. None of the above

13. Find all solutions of the equation in the interval $[0, 2\pi)$.

$$\sin t - \sin 2t = 0$$

   A. $t = \dfrac{\pi}{2}, \dfrac{3\pi}{2}, \dfrac{2\pi}{3}, \dfrac{4\pi}{3}$

   B. $t = 0, \pi, \dfrac{\pi}{3}, \dfrac{5\pi}{3}$

   C. $t = \dfrac{\pi}{2}, \dfrac{3\pi}{2}, \dfrac{\pi}{3}, \dfrac{5\pi}{3}$

   D. $t = 0, \pi, \dfrac{2\pi}{3}, \dfrac{4\pi}{3}$

   E. None of the above

14. If $\sin \alpha = \dfrac{-4}{5}$ and $\cos \beta = \dfrac{7}{25}$, for a **third**-quadrant angle α and a

   first-quadrant angle β, find $\cos(\alpha + \beta)$.

A. $\dfrac{-4}{5}$

B. $\dfrac{-117}{125}$

C. $\dfrac{44}{125}$

D. $\dfrac{3}{5}$

E. None of the above

15. Find the exact value of $\cos 2\theta$ if $\tan \theta = \dfrac{-5}{6}$ and $270° < \theta < 360°$

A. $\dfrac{-11}{61}$

B. $\dfrac{-60}{61}$

C. $\dfrac{5}{61}$

D. $\dfrac{60}{61}$

E. None of the above

Lessons 12-20, Covers Sections 6.7, 7.2, 7.3, and 7.4

Question	Answers	Letters
1.	$5\sqrt{3}$	E
2.	21.1	B
3.	$c = a\sec\beta$	C
4.	742 *feet*	A
5.	22.1°	C
6.	168 *miles*	D
7.	$S69°W$	C
8.	$\theta = \dfrac{2\pi}{3} + \pi n$	A
9.	$\theta = \dfrac{\pi}{6} + \pi n, \dfrac{\pi}{3} + \pi n$	B
10.	$\theta = \dfrac{3\pi}{8}, \dfrac{7\pi}{8}, \dfrac{11\pi}{8}, \dfrac{15\pi}{8}$	D
11.	$\theta = \dfrac{\pi}{6}, \dfrac{5\pi}{6}, \dfrac{\pi}{2}$	C
12.	$\sin(20°)$	B
13.	$t = 0, \pi, \dfrac{\pi}{3}, \dfrac{5\pi}{3}$	B
14.	$\dfrac{3}{5}$	D
15.	$\dfrac{11}{61}$	E