MA 15400, Fall 2009
EXAM 2
Form A

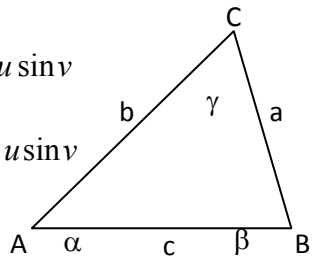
Answers are on the last page.

$\sin^2\theta + \cos^2\theta = 1$ $\quad 1 + \tan^2\theta = \sec^2\theta$ $\quad 1 + \cot^2\theta = \csc^2\theta$

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

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

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



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

1. A 25 foot ladder leans against the side of a 100 foot tall building. The angle between the ladder and the building is $23°$. If the **bottom** of the ladder is then moved **2 feet closer** to the building, to the nearest tenth of a degree, what is the angle that the ladder now makes with the side of the building?

A. $28.1°$

B. $20.4°$

C. $18.1°$

D. $22.2°$

E. None of the above

2. Express as a trigonometric function of one angle.

$$\sin 43° \cos 17° - \cos 43° \sin 17°$$

A. $\sin 26°$

B. $\cos 60°$

C. $\sin 60°$

D. $\cos 26°$

E. None of the above

3. Given ΔABC with $\gamma = 90°$, express side *a* in terms of angle β and side *b*.

A. $a = b \sin \beta$

B. $a = b \cos \beta$

C. $a = b \sec \beta$

D. $a = b \tan \beta$

E. $a = b \cot \beta$

Questions 4 and 5: An airplane is traveling at 250 miles per hour for 3 hours in the directions 130° and then flies in the direction 220° for 1 hour.

4. To the nearest mile, how far is the plan from its starting point?

A. $599\,\text{miles}$

B. $448\,\text{miles}$

C. $559\,\text{miles}$

D. $791\,\text{miles}$

E. None of the above

5. To the nearest degree, in what direction does the plan need to fly in order to get back to the start point?

A. $288°$

B. $328°$

C. $318°$

D. $302°$

E. None of the above

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

$$\tan\left(3x-\frac{\pi}{4}\right)=-1$$

A. $x=\frac{\pi}{4}+\frac{\pi}{4}n$

B. $x=\frac{7\pi}{36}+\frac{\pi}{3}n$

C. $x=\frac{\pi}{6}+\frac{\pi}{3}n$

D. $x=\frac{\pi}{3}+\frac{\pi}{3}n$

E. $x=\frac{5\pi}{36}+\frac{\pi}{3}n$

7. Find the exact solutions of the equation that are in the interval $[0,2\pi)$.

$$2\cos^2 t+3\cos t+1=0$$

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

B. $t=\frac{\pi}{6},\frac{11\pi}{6},0$

C. $t=\frac{\pi}{3},\frac{5\pi}{3},0$

D. $t=\frac{5\pi}{6},\frac{7\pi}{6},\pi$

E. None of the above

8. If α and β are second-quadrant angles such that $\tan\alpha = \frac{-4}{3}$, and $\sec\beta = -6$, find $\cos(\alpha+\beta)$.

A. $\frac{4-3\sqrt{35}}{30}$

B. $\frac{3-4\sqrt{35}}{30}$

C. $\frac{4+3\sqrt{35}}{30}$

D. $\frac{3+4\sqrt{35}}{30}$

E. None of the above

9. Find the exact value of $\tan(2\theta)$ if $\cos\theta = \frac{-7}{\sqrt{113}}; 180° < \theta < 270°$.

A. $\frac{-15}{113}$

B. $\frac{15}{113}$

C. $\frac{-112}{15}$

D. $\frac{112}{15}$

E. None of the above

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

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

A. $0, \pi, \frac{\pi}{3}, \frac{5\pi}{3}$

B. $\frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{6}, \frac{11\pi}{6}$

C. $\frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{3}, \frac{5\pi}{3}$

D. $0, \pi, \frac{2\pi}{3}, \frac{4\pi}{3}$

E. None of the above

11. Find the exact value of the expression whenever it is defined.

$$\sin^{-1}\left(\sin\frac{4\pi}{3}\right)$$

A. $\frac{5\pi}{3}$

B. $\frac{4\pi}{3}$

C. $\frac{2\pi}{3}$

D. $\frac{-\pi}{3}$

E. None of the above

12. Which of the following is equivalent to $\sin\left(\theta+\frac{3\pi}{2}\right)$? (There are only four choices)

A. $\cos\theta$

B. $\sin\theta$

C. $-\cos\theta$

D. $-\sin\theta$

13. Find the equivalent algebraic expression in *x* for *x*> 0.

$$\sin\left(2\tan^{-1}\left(3x\right)\right)$$

A. $\frac{1-9x^2}{9x^2+6x+1}$

B. $\frac{6x}{9x^2+1}$

C. $\frac{6x}{9x^2+6x+1}$

D. $\frac{1-9x^2}{9x^2+1}$

E. None of the above

14. Think about the graph of $y = 2\sin^{-1}(3x)$. Are you thinking? You might want to sketch it.
Which of the following is true about the graph?
(Hint: Domains refers to the possible values of x and range the possible values of *y*)

A. Domain is $\left[\frac{-1}{3}, \frac{1}{3}\right]$, Range is $[-\pi, \pi]$

B. Domain is $[-3, 3]$, Range is $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$

C. Domain is $[-3, 3]$, Range is $[-\pi, \pi]$

D. Domain is $\left[\frac{-1}{3}, \frac{1}{3}\right]$, Range is $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$

E. None of the above

15. Approximate the solutions to four decimal places in the interval $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$.

$$2\tan^2 x - 3\tan x - 5 = 0$$

A. $2.3562, -1.9513$

B. $1.2490, -0.9828$

C. $1.4508, -0.1960$

D. $1.1903, -0.7854$

E. None of the above

Exam 2 Answers

Question	Form A - Green	
1.	C	$18.1°$
2.	A	$\sin 26°$
3.	E	$a = b\cot\beta$
4.	D	791miles
5.	B	$328°$
6.	D	$x = \frac{\pi}{3} + \frac{\pi}{3}n$
7.	A	$t = \frac{2\pi}{3}, \frac{4\pi}{3}, \pi$
8.	B	$\frac{3-4\sqrt{35}}{30}$
9.	C	$\frac{-112}{15}$
10.	A	$0, \pi, \frac{\pi}{3}, \frac{5\pi}{3}$
11.	D	$\frac{-\pi}{3}$
12.	C	$-\cos\theta$
13.	B	$\frac{6x}{9x^2+1}$
14.	A	Range is $[-\pi, \pi]$, Domain is $\left[\frac{-1}{3}, \frac{1}{3}\right]$
15.	D	$1.1903, -0.7854$