MA 15400

Fall 2013

Exam 2

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

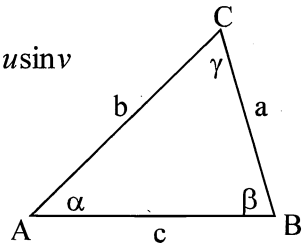
$\cos(u+v) = \cos u\cos v - \sin u\sin v$

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

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

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

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



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

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

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

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

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

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

MA 15400 Exam 2 Fall 2013

Covers Lessons 10 – 20, Sections 6.5, 6.7, 7.2, 7.3 and 7.4

1. Express as a trigonometric function of one angle: $\cos 48° \cos 13° - \sin 48° \sin 13°$

A. $\cos(35°)$

B. $\sin(61°)$

C. $\sin(35°)$

D. $\cos(61°)$

E. None of the above

$\cos(48° + 13°)$

$\cos(61°)$

2. Graph the function $y = 3\sin(\pi x + \pi)$. Which **one** of the following statements **is true**.

A. The function is decreasing in the interval $\left[\frac{1}{2}, \frac{3}{2}\right]$

B. $(0, -3)$ is the y-intercept

C. The phase shift is $\frac{3}{2}$

D. $\frac{1}{2}$ *and* $\frac{3}{2}$ are zeroes of the function

E. None of the above statements are true

not on SP '14 Ex. 2

3. Given triangle *ABC,* with $\gamma = 90°$, $\beta = 52°$, and side $b = 12.6$, find the length of side a to the nearest tenth.

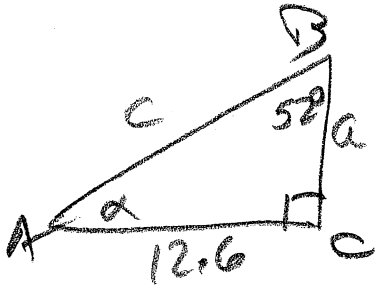
A. 9.8

B. 8.5

C. 11.8

D. 15.2

E. None of the above



$\tan 52° = \frac{12.6}{a}$

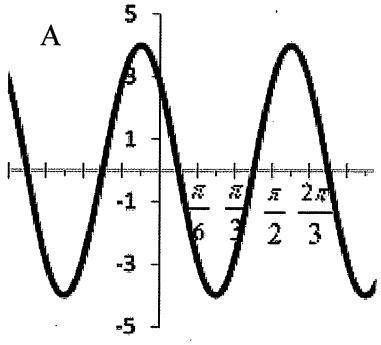
$a = \frac{12.6}{\tan 52°}$

$a = 9.8$

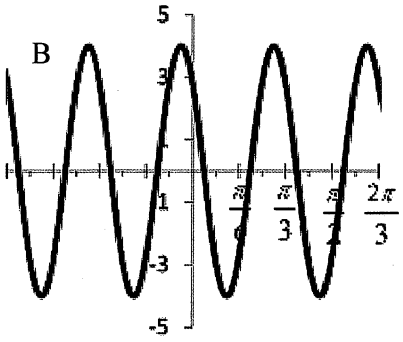
4. Which of the following is the graph of $y = 4\cos\left(3x - \frac{\pi}{4}\right)$? (Notice this is a cosine function)

NOT on SP '14 Ex. 2

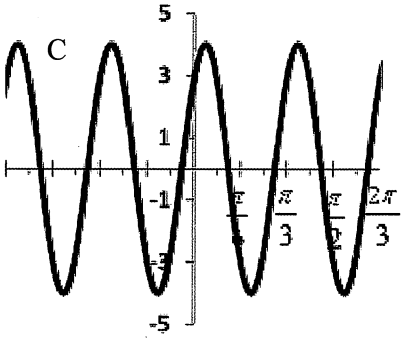
A



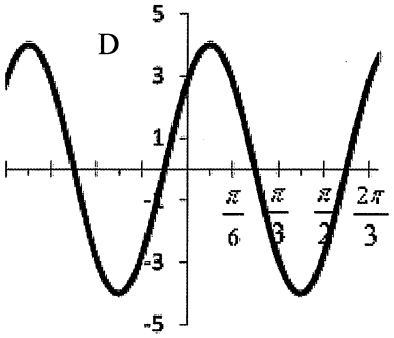
B



C



D



5. Given triangle *ABC,* with $\gamma = 90°$, express side c in terms of angle β and side a.

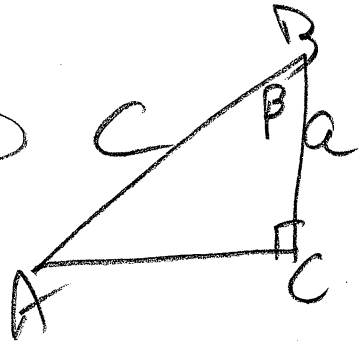
A. $c = a\cos\beta$

B. $c = a\sec\beta$

C. $c = a\csc\beta$

D. $c = a\cot\beta$

E. $c = a\sin\beta$



$\cos B = \frac{a}{c}$

$c = \frac{a}{\cos\beta} = a\sec\beta$

6. Two buildings, one short and one tall, are standing on level ground an unknown distance apart. From the top of the shorter building, the angle of elevation of the top of the taller building is 39° and, again from the top of the shorter building, the angle of depression of the bottom of the taller building is 17°. If shorter building is 100 feet tall, what is the height of the taller building? Please round to the nearest foot.

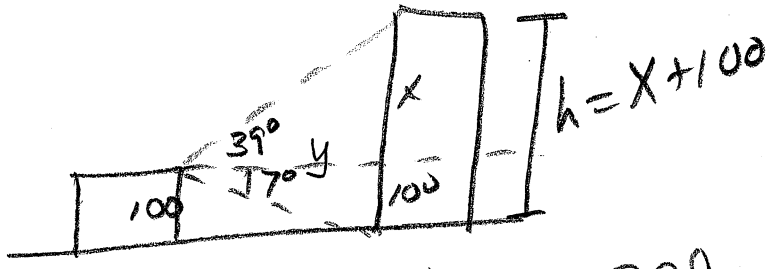
A. 365 *ft.*

B. 246 *ft.*

C. 285 *ft.*

D. 126 *ft.*

E. None of the above



$\tan 17^\circ = \frac{100}{y}$

$y = \frac{100}{\tan 17^\circ}$

$y = 327$

$\tan 39^\circ = \frac{x}{y}$

$\tan 39^\circ = \frac{x}{327}$

$327 \tan 39^\circ = x$

$x = 265$

$h = 265 + 100$

$h = 365 ft$

7. A builder wishes to construct a ramp at an angle of 9° with the horizontal to a height of 2 feet above the level ground. Approximate the length of the ramp to the nearest tenth of a foot.

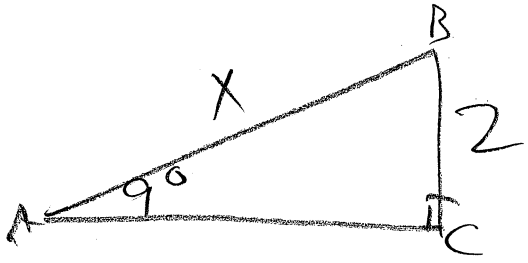
A. 12.6 *ft.*

B. 14.4 *ft.*

C. 12.8 *ft.*

D. 14.6 *ft.*

E. None of the above



$\sin 9^\circ = \frac{2}{x}$

$x = \frac{2}{\sin 9^\circ} = 12.8$

8. Find all solutions of the equation $2\cos(2\theta)-\sqrt{3}=0$ using n as an arbitrary integer.

A. $\theta=\frac{\pi}{6}+\pi n,\frac{5\pi}{6}+\pi n$

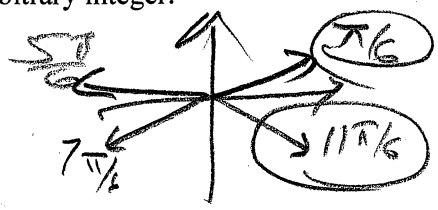
B. $\theta=\frac{\pi}{12}+\pi n,\frac{11\pi}{12}+\pi n$

C. $\theta=\frac{\pi}{3}+\pi n,\frac{4\pi}{3}+\pi n$

D. $\theta=\frac{\pi}{8}+\pi n,\frac{7\pi}{8}+\pi n$

E. None of the above

$\cos 2\theta=\frac{\sqrt{3}}{2}$



$2\theta=\frac{\pi}{6}+2\pi n$

$\theta=\frac{\pi}{12}+\pi n$

$2\theta=\frac{11\pi}{6}+2\pi n$

$\theta=\frac{11\pi}{12}+\pi n$

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

$$\cot\left(2\theta-\frac{\pi}{3}\right)=\sqrt{3}$$

A. $\frac{\pi}{4},\frac{3\pi}{4},\frac{5\pi}{4},\frac{7\pi}{4}$

B. $\frac{\pi}{12},\frac{13\pi}{12}$

C. $\frac{\pi}{4},\frac{5\pi}{4}$

D. $\frac{\pi}{12},\frac{7\pi}{12},\frac{13\pi}{12},\frac{19\pi}{12}$

E. None of the above

$\tan\left(2\theta-\frac{\pi}{3}\right)=\frac{1}{\sqrt{3}}$

$2\theta-\frac{\pi}{3}=\frac{\pi}{6}+\pi n$

$2\theta=\frac{\pi}{3}+\frac{\pi}{6}+\pi n$

$2\theta=\frac{\pi}{2}+\pi n$

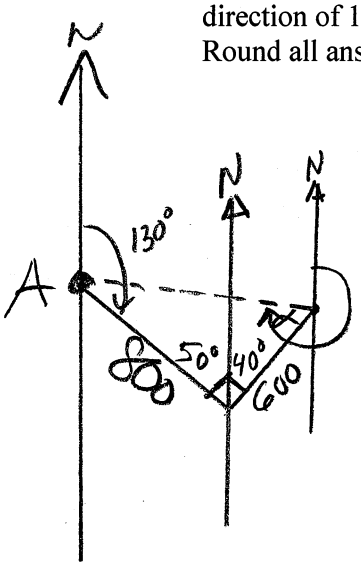
$\theta=\frac{\pi}{4}+\frac{\pi}{2}n$

Rewrite with common Den

$\theta=\frac{\pi}{4}+\frac{2\pi}{4}n$

n	θ
0	π/4
1	3π/4
2	5π/4
3	7π/4
4	TOO BIG
−1	TOO SMALL

Questions 10 and 11: An airplane flying at a speed of 400 miles per hour flies from Point A in the direction of 130° for 2 hours and then in the direction 40° for 1.5 hours. Round all answers to the nearest tenth.



$D = rt$

$D_1 = 400(2) = 800$

$D_2 = 400(1.5) = 600$

$180 - 130 = 50$

10. How long will it take for the plane to return to Point A?

$D = rt$

$t = \frac{D}{r}$

$D^2 = 800^2 + 600^2$

$D = 1000$

$t = \frac{1000}{400} = 2.5$

A. 2.7 *hours*

B. 3.1 *hours*

C. 2.9 *hours*

D. 2.5 *hours*

E. None of the above

11. In what direction does the plane need to fly in order to get back to Point A?

$N \text{ to } S = 180°$

$\text{Alt. Int} = 40°$

$\alpha = 53.1°$

$273.1°$

$\tan\alpha = \frac{800}{600}$

$\alpha = \tan^{-1}\left(\frac{4}{3}\right)$

$\alpha = 53.1°$

A. 248.8°

B. 273.1°

C. 256.9°

D. 265.0°

E. None of the above

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

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

A. $\frac{\pi}{3},\frac{2\pi}{3},\frac{\pi}{2}$

B. $\frac{\pi}{6},\frac{5\pi}{6},\frac{\pi}{2}$

C. $\frac{\pi}{6},\frac{5\pi}{6},\frac{3\pi}{2}$

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

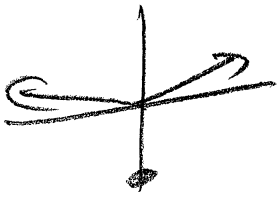
E. None of the above

$(2\sin\theta-1)(\sin\theta+1)=0$

$2\sin\theta-1=0$ $\quad\sin\theta+1=0$

$\sin\theta=\frac{1}{2}$ $\quad\sin\theta=-1$

$\theta=\frac{\pi}{6},\frac{5\pi}{6}$ $\quad\theta=\frac{3\pi}{2}$



13. If α and β are second-quadrant angles such that $\cos\alpha=\frac{-3}{5}$ and $\sin\beta=\frac{6}{7}$, find $\cos(\alpha-\beta)$.

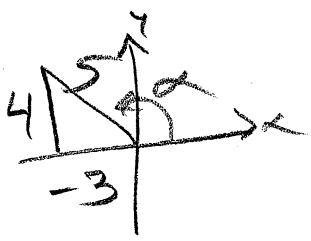
A. $\frac{3\sqrt{13}+24}{35}$

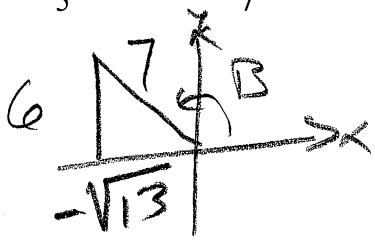
B. $\frac{-4\sqrt{13}-18}{35}$

C. $\frac{-3\sqrt{13}-24}{35}$

D. $\frac{4\sqrt{13}+18}{35}$

E. None of the above





$7^2=6^2+b^2$

$b=\pm\sqrt{13}$

$\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin\beta$

$=\left(\frac{-3}{5}\right)\left(\frac{-\sqrt{13}}{7}\right)+\left(\frac{4}{5}\right)\left(\frac{6}{7}\right)$

$=\frac{3\sqrt{13}}{35}+\frac{24}{35}=\frac{3\sqrt{13}+24}{35}$

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

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

A. $\frac{\pi}{2},\frac{3\pi}{2},\frac{7\pi}{6},\frac{11\pi}{6}$

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

C. $0,\pi,\frac{\pi}{6},\frac{11\pi}{6}$

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

E. None of the above

$2\sin t\cos t+\sin t=0$

$\sin t(2\cos t+1)=0$

$\sin t=0$ $\quad 2\cos t+1=0$

$t=0,\pi$ $\quad \cos t=-\frac{1}{2}$

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

15. Given $\csc\theta=\frac{-29}{20}$; $270°<\theta<360°$ find $\cos(2\theta)$

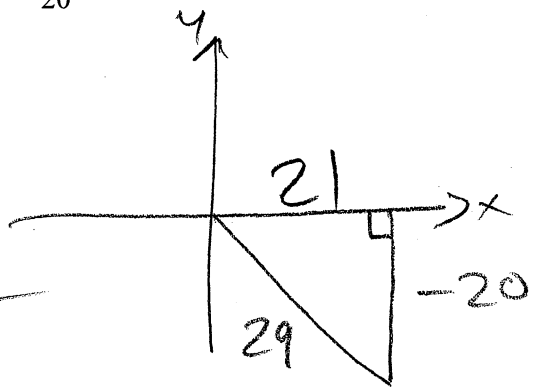
A. $\frac{-41}{841}$

B. $\frac{840}{841}$

C. $\frac{41}{841}$

D. $\frac{-840}{841}$

E. None of the above



$\sin\theta=\frac{-20}{29}$

$29^2-20^2=b^2$

$b=\pm 21$

$\cos 2\theta=\cos^2\theta-\sin^2\theta$

$=\left(\frac{21}{29}\right)^2-\left(\frac{-20}{29}\right)^2$

$=\frac{441}{841}-\frac{400}{841}=\frac{41}{841}$

Exam 2 Answers

1.	D	$\cos(61°)$
2.	E	None of the above statements are true
3.	A	9.8
4.	D	*See Graph*
5.	B	$c = a\sec\beta$
6.	A	365 *ft.*
7.	C	12.8 *ft.*
8.	B	$\theta = \frac{\pi}{12} + \pi n, \frac{11\pi}{12} + \pi n$
9.	A	$\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$
10.	D	2.5 *hours*
11.	B	273.1°
12.	C	$\frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$
13.	A	$\frac{3\sqrt{13}+24}{35}$
14.	D	$0, \pi, \frac{2\pi}{3}, \frac{4\pi}{3}$
15.	C	$\frac{41}{841}$