

# MA 15400

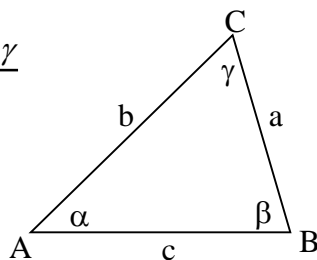
## Fall 2012

### Exam 3

(With 2 questions from Exam 2, Fall 2012)

**LAW OF SINES:**

$$\frac{\sin \alpha}{a} = \frac{\sin \beta}{b} = \frac{\sin \gamma}{c}$$



**LAW OF COSINES:**

$$c^2 = a^2 + b^2 - 2ab \cos \gamma$$

**Quadratic Formula:**

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Covers Lessons 23 to 32, Sections 7.6 (questions 53-67), 8.1, 8.2, and 8.3

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

$$\cos^{-1}\left(\cos\left(\frac{5\pi}{3}\right)\right) =$$

From Exam 2, Fall 2012

- A.  $\frac{\pi}{3}$
- B.  $\frac{2\pi}{3}$
- C.  $\frac{-\pi}{3}$
- D.  $\frac{5\pi}{3}$
- E. None of the above

15. Write the expression as an algebraic expression in  $x$  for  $x > 0$ .

$$\sin\left(2\sin^{-1}\left(\frac{x}{4}\right)\right)$$

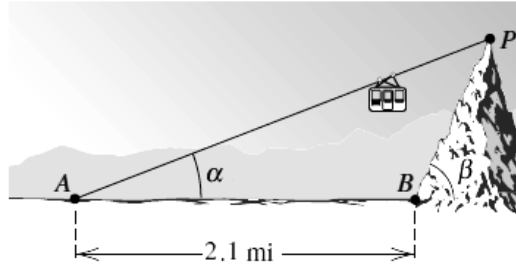
From Exam 2, Fall 2012

- A.  $\frac{x}{2}$
- B.  $\frac{x - x^2}{2}$
- C.  $\frac{4x - x^2}{8}$
- D.  $\frac{x\sqrt{16 - x^2}}{8}$

Covers Lessons 23 to 32, Sections 7.6 (questions 53-67), 8.1, 8.2, and 8.3

1. Find  $2a + 3b$  for  $a = \langle 3, -5 \rangle$  and  $b = \langle -6, 8 \rangle$
- A.  $\langle -6, 9 \rangle$
  - B.  $\langle -3, 1 \rangle$
  - C.  $\langle -12, 14 \rangle$
  - D.  $\langle -9, 6 \rangle$
  - E. None of the above
2. Approximate the solutions of the equation, to four decimal places, that are in the interval  $[0, 2\pi)$ .
- $$6\sin x \cos x = 7 \cos x$$
- A.  $x = 1.3808, 4.6035$
  - B.  $x = 1.2489, 3.9521$
  - C.  $x = 1.2489, 4.6035$
  - D.  $x = 1.3808, 3.9521$
  - E. None of the above
3. Approximate the solutions of the equation, to four decimal places, that are in the interval  $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$ .
- $$2 \tan^2 t + 9 \tan t - 5 = 0$$
- A.  $t = 1.2032, -0.5758$
  - B.  $t = 0.4636, -1.3734$
  - C.  $t = 2.5969, -0.6492$
  - D.  $t = 0.5989, -1.4731$
  - E. None of the above

- 4 and 5: As shown in the figure below, a cable car carries passengers from a point  $A$ , which is 2.1 miles from a point  $B$  at the base of a mountain, to a point  $P$  at the top of the mountain. The angles of elevation of  $P$  from  $A$  and  $B$  are  $\alpha = 20^\circ$  and  $\beta = 71^\circ$ , respectively.



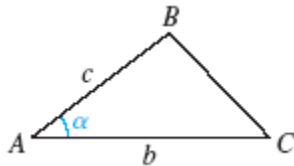
**Check the mode on your calculator!  
Check it again!  
One more time!**

4. Approximate, to two decimal places, the distance between  $A$  and  $P$ .
- A. 2.55 miles
  - B. 2.64 miles
  - C. 2.86 miles
  - D. 2.71 miles
  - E. None of the above
5. Approximate, to two decimal places, the height of the mountain.
- A. 0.93 miles
  - B. 0.87 miles
  - C. 0.98 miles
  - D. 0.90 miles
  - E. None of the above

Covers Lessons 23 to 32, Sections 7.6 (questions 53-67), 8.1, 8.2, and 8.3

6. A surveyor notes that the direction from point  $A$  to point  $B$  is  $N57^\circ W$  and the direction from  $A$  to point  $C$  is  $S17^\circ W$ . The distance from  $A$  to  $B$  is 209 yards, and the distance from  $B$  to  $C$  is 354 yards. Approximate the distance from  $A$  to  $C$  to the nearest whole yard.
- A. 292 yds.  
B. 349 yds.  
C. 234 yds.  
D. 286 yds.  
E. None of the above

7. Given the indicated parts of  $\triangle ABC$ , what **angle or side** would you find next, and what would you use to find it?



- A. Angle  $\gamma$ , Law of Sines  
B. Side  $a$ , Law of Cosines  
C. Angle  $\beta$ , Law of Sines  
D. Side  $a$ , Law of Sines  
E. Angle  $\gamma$ , Law of Cosines
8. Solve  $\triangle ABC$  for  $\beta = 143^\circ$ ,  $a = 130$ , and  $c = 27$ . Approximate the values to one decimal place.
- A.  $\gamma = 6.1^\circ$ ,  $\alpha = 30.9^\circ$ ,  $b = 152.4$   
B.  $\gamma = 8.5^\circ$ ,  $\alpha = 28.5^\circ$ ,  $b = 109.6$   
C.  $\gamma = 7.1^\circ$ ,  $\alpha = 29.9^\circ$ ,  $b = 131.0$   
D.  $\gamma = 6.6^\circ$ ,  $\alpha = 30.4^\circ$ ,  $b = 141.7$   
E. None of the above

Covers Lessons 23 to 32, Sections 7.6 (questions 53-67), 8.1, 8.2, and 8.3

9. Given  $\triangle ABC$ , with  $a = 12, b = 15$ , and  $c = 23$ . Approximate the value of the smallest angle in the triangle to one decimal place.
- A.  $24.0^\circ$   
B.  $35.7^\circ$   
C.  $27.9^\circ$   
D.  $31.8^\circ$   
E. None of the above
10. A ship leaves port at 1:00 P.M. and travels  $S35^\circ E$  at the rate of 25 mph. Another ship leaves the same port at the same time. and travels  $S20^\circ W$  at 20 mph. To the nearest tenth of a mile, approximately how far apart are the ships at 4:00 P.M.?
- A.  $63.7 \text{ miles}$   
B.  $96.0 \text{ miles}$   
C.  $119.9 \text{ miles}$   
D.  $45.0 \text{ miles}$   
E. None of the above
11. Find the magnitude of the vector  $a$  and the smallest positive angle  $\theta$  from the positive  $x$ -axis to the vector that corresponds to  $a$ . Round your answers to one decimal.

$$a = -8i + 2j$$

- A.  $\|a\| \approx 4.5, \theta \approx 166.0^\circ$   
B.  $\|a\| \approx 8.2, \theta \approx 104.0^\circ$   
C.  $\|a\| \approx 4.5, \theta \approx 104.0^\circ$   
D.  $\|a\| \approx 8.2, \theta \approx 166.0^\circ$   
E. None of the above

Covers Lessons 23 to 32, Sections 7.6 (questions 53-67), 8.1, 8.2, and 8.3

12. The vectors **a** and **b** represent two forces acting at the same point, and  $\theta$  is the smallest positive angle between **a** and **b**. Approximate the magnitude of the resultant force to one decimal place.

$$\|a\| = 5.9 \text{ lb.}, \|b\| = 6.8 \text{ lb.}, \theta = 80^\circ$$

- A.  $\|r\| \approx 9.4 \text{ lb.}$
- B.  $\|r\| \approx 10.4 \text{ lb.}$
- C.  $\|r\| \approx 9.7 \text{ lb.}$
- D.  $\|r\| \approx 8.2 \text{ lb.}$
- E. None of the above
13. The given information about  $\triangle ABC$ ,  $\gamma = 64^\circ$ ,  $c = 23$  and  $b = 25$ , creates two triangles. Find the perimeter of both triangles, rounded to one decimal place.
- A. 65.5, 55.9
- B. 64.9, 52.4
- C. 62.7, 53.6
- D. 63.9, 54.0
- E. None of the above

Covers Lessons 23 to 32, Sections 7.6 (questions 53-67), 8.1, 8.2, and 8.3

14. Find a vector of **magnitude 6** that has the **opposite** direction of  $a = -5i + 12j$
- A.  $30i - 72j$
  - B.  $\frac{30}{13}i - \frac{72}{13}j$
  - C.  $-30i + 72j$
  - D.  $-\frac{30}{13}i + \frac{72}{13}j$
  - E. None of the above
15. An airplane is flying in the direction  $100^\circ$  with airspeed of 400 mph, and a 30 mph wind is blowing in the direction  $25^\circ$ . Approximate the true course and ground speed of the airplane to the nearest whole numbers.
- A. 393mph,  $72^\circ$
  - B. 409mph,  $72^\circ$
  - C. 393mph,  $96^\circ$
  - D. 409mph,  $96^\circ$
  - E. None of the above



## Exam 3 Answers

	Answer	Letter
14.	$\frac{\pi}{3}$	A
15.	$\frac{x\sqrt{16-x^2}}{8}$	D
1.	$\langle -12, 14 \rangle$	C
2.	$x = 1.5708, 4.7124$	E
3.	$t = 0.4636, -1.3734$	B
4.	$2.55 \text{ miles}$ (Too close to 2.56, sorry)	A or E
5.	$0.87 \text{ miles}$	B
6.	$234 \text{ yds.}$	C
7.	Side $a$ , Law of Cosines	B
8.	$\gamma = 6.1^\circ, \alpha = 30.9^\circ, b = 152.4$	A
9.	$27.9^\circ$	C
10.	$63.7 \text{ miles}$	A
11.	$\ a\  \approx 8.2, \theta \approx 166.0^\circ$	D
12.	$\ r\  \approx 9.7 \text{ lb.}$	C
13.	$63.9, 54.0$	D
14.	$\frac{30}{13}i - \frac{72}{13}j$	B
15.	$409 \text{ mph}, 96^\circ$	D

From Exam 2, Fall 2012

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