

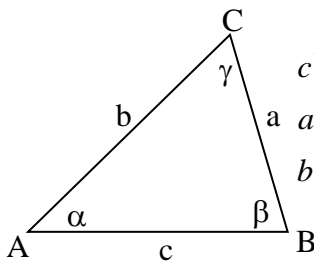
MA 15400

Fall 2013

Exam 3

LAW OF SINES:

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



LAW OF COSINES:

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

$$a^2 = b^2 + c^2 - 2bc \cos \alpha$$

$$b^2 = a^2 + c^2 - 2ac \cos \beta$$

Double Angle Formulas:

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

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

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

Quadratic Formula:

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

Angle Between Two Vectors:

$$\cos \theta = \frac{(\vec{a}) \cdot (\vec{b})}{\|\vec{a}\| \|\vec{b}\|}$$

1. Find the exact value of the expression.

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

- A. $\frac{-\pi}{3}$
B. $\frac{4\pi}{3}$
C. $\frac{\pi}{3}$
D. $\frac{5\pi}{3}$
E. None of the above

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

$$\sin(2\cos^{-1}x)$$

- A. $2x - 2x^2$
B. $1 - x^2$
C. $-1 + 2x$
D. $2x\sqrt{1-x^2}$
E. None of the above

3. Use inverse trigonometric functions to find the solutions of the equation that are in the given interval, and approximate the solutions to four decimal places.

$$3\cos^2 x + 4\cos x - 5 = 0 \quad [0, 2\pi)$$

- A. 2.4756, 3.8076
B. 0.6660, 5.6172
C. 0.9048, 2.2368
D. 4.0464, 5.3784
E. None of the above

This would be a good time to check the mode on your calculator!

4. Given $\triangle ABC$ with $\alpha = 97^\circ$, $\gamma = 25^\circ$, and $a = 21.5$. Find the values of sides b and c rounded to one decimal place.
- A. $b = 18.4$ and $c = 9.2$
 - B. $b = 18.9$ and $c = 8.1$
 - C. $b = 18.9$ and $c = 9.2$
 - D. $b = 18.4$ and $c = 8.1$
 - E. None of the above
5. A surveyor notes that the direction from point A to point B is $N50^\circ W$ and the direction from A to point C is $S30^\circ W$. The distance from A to B is 275 yards, and the distance from B to C is 450 yards. Approximate the distance from A to C to the nearest whole yard.
- A. 324 yards
 - B. 297 yards
 - C. 312 yards
 - D. 289 yards
 - E. None of the above
6. An airplane flies 333 miles from point A in the direction 50° and then travels in the direction 200° for 222 miles. To the nearest mile, approximately how far is the airplane from A?
- A. 267 miles
 - B. 198 miles
 - C. 248 miles
 - D. 179 miles
 - E. None of the above

7. Given $\triangle ABC$ with $\alpha = 51^\circ$, $a = 375$ and $c = 452$, which statement is true?
- A. There exist two possible triangles and one of the values of $b = 153.2$.
 - B. There only exists one possible triangle and $\beta = 59.5^\circ$
 - C. There exist two possible triangles and one of the values of $\gamma = 112.3^\circ$.
 - D. There only exists one possible triangle and $b = 421.7$
 - E. There is not enough information to solve for the rest of the triangle.
8. Given $a = \langle 4, 6 \rangle$ and $b = \langle -5, 2 \rangle$ find $3a - 4b$.
- A. $\langle -31, -18 \rangle$
 - B. $\langle -8, 36 \rangle$
 - C. $\langle 32, 10 \rangle$
 - D. $\langle 8, -36 \rangle$
 - E. None of the above
9. Given vector $c = -8i + 4j$ find $\|c\|$ to the nearest tenth.
- A. $\|c\| = 8.7$
 - B. $\|c\| = 8.1$
 - C. $\|c\| = 8.3$
 - D. $\|c\| = 8.5$
 - E. None of the above

10. The magnitudes and directions of two forces acting at a point P are...

$$4.4\text{ lb}, 50^\circ$$

$$9.7\text{ lb}, 165^\circ$$

Approximate the direction of the result vector to the nearest whole degree.

- A. $\theta = 129^\circ$
- B. $\theta = 132^\circ$
- C. $\theta = 134^\circ$
- D. $\theta = 138^\circ$
- E. None of the above

11. Find a vector that has the same direction as $\langle -6, 8 \rangle$ and five times its magnitude.

- A. $\langle 30, -40 \rangle$
- B. $\langle 3, -4 \rangle$
- C. $\langle -30, 40 \rangle$
- D. $\langle -3, 4 \rangle$
- E. None of the above

12. Find the angle between the two vectors $a = \langle -7, -6 \rangle, b = \langle -2, 10 \rangle$.

Round to the nearest tenth of a degree.

- A. 121.5°
- B. 119.3°
- C. 122.6°
- D. 113.9°
- E. None of the above

13. Determine m such that the two vectors $c = \langle 2m, -4 \rangle$, $d = \langle 5, 6 \rangle$ are orthogonal.

- A. $m = 3.75$
- B. $m = -2.4$
- C. $m = -3.75$
- D. $m = 2.4$
- E. None of the above

Questions 14 and 15. An airplane is flying in the direction 165° with airspeed of 450 mph, and a 50 mph wind is blowing directly **from** the west.

14. Approximate the Ground Speed of the airplane to the nearest mph.

- A. 465 *mph*
- B. 441 *mph*
- C. 447 *mph*
- D. 471 *mph*
- E. None of the above

15. Approximate the True Course of the airplane to the nearest whole degree.

- A. 157°
- B. 159°
- C. 151°
- D. 153°
- E. None of the above

Exam 3 Answers

1.	C	$\frac{\pi}{3}$
2.	D	$2x\sqrt{1-x^2}$
3.	B	0.6660, 5.6172
4.	A	$b = 18.4$ and $c = 9.2$
5.	C	312 <i>yards</i>
6.	D	179 <i>miles</i>
7.	A	There exist two possible triangles and one of the values of $b = 153.2$.
8.	C	$\langle 32, 10 \rangle$
9.	E	$\ c\ = 8.9$
10.	D	$\theta = 138^\circ$
11.	C	$\langle -30, 40 \rangle$
12.	B	119.3°
13.	D	$m = 2.4$
14.	A	465 <i>mph</i>
15.	B	159°