

### Accelerated Math 3

#### Topics and Suggested Review Problems – Test 4

Test 4 will have the following 3 topics from the previous tests: (1) law of sines and law of cosines, (2) prove trig identities, and (3) solve trig equations. The following problems are in no particular order – this should help you prepare for the test, since you need to be able to decide how to approach particular problems.

1. Derive a formula for  $\cos\left(\theta + \frac{\pi}{2}\right)$
2. If  $\cos u = \frac{1}{5}$  and  $\sin v = \frac{1}{3}$ , find  $\sin 2u$ ,  $\cos 2u$ ,  $\tan 2u$ ,  $\sin 2v$ ,  $\cos 2v$ , and  $\tan 2v$ . Assume that  $u$  and  $v$  are both in the first quadrant.
3. If two sides of a triangle are  $b = 9$  m and  $c = 12$  m and the angle in between the two sides is  $25^\circ$ , what are the possible lengths of the third side of the triangle?
4. What are the components of a vector whose magnitude is 25 and whose direction is  $193^\circ$ ?
5. What are the magnitude and direction of vector  $\vec{c} = -8\vec{i} - 3\vec{j}$ ?
6. Given that  $\vec{d} = -6\vec{i} + 10\vec{j}$  and  $\vec{e} = 2\vec{i} - 4\vec{j}$  find each of the following:  
(a)  $\vec{d} + \vec{e}$     (b)  $\vec{d} - \vec{e}$     (c)  $\vec{d} \cdot \vec{e}$     (d)  $\theta$  the angle between  $\vec{d}$  and  $\vec{e}$   
(e) the magnitude and bearing of  $\vec{d}$  and  $\vec{e}$
7. See problem 16 on page 279 of your textbook.
8. Castle Height Problem. Sir Vey wants to find the height of King Arthur's castle. He cannot get right up to the castle because it is surrounded by a moat. From a point on the ground, he measures an angle of  $37^\circ$  to the top of the castle. He moves 75 feet closer and measures an angle of  $65^\circ$  to the top of the castle. Calculate the height of the castle.
9. CB Radio Problem. A CB radio operator has a base station on Farm Road, 8 miles from where it intersects Interstate 30. Farm Road makes an angle of  $32^\circ$  with I-30. If the radio has a range of 5 miles, between what two distances from the intersection can cars on the highway hear the base station radio?
10. Find the area of a triangle with a two sides of length 28 and 44 feet and the angle in between the two sides is  $50^\circ$ .
11. Find the displacement vector  $\overline{CD}$  for points  $C(4,1)$  and  $D(3,5)$ .
12. Find a point  $\frac{2}{3}$  of the way from point  $C(11,5)$  to point  $D(2,17)$ .
13. An airplane is traveling at a speed of 500 miles an hour at a bearing of  $330^\circ$ . The plane encounters a wind blowing at 70 miles an hour with a bearing of  $45^\circ$ . What is the resultant speed of the plane (that is, what is the magnitude and direction of the plane?).
14. Solve  $\cos x (\cos x + 1) = 0$  for  $[-\pi, 2\pi]$
15. Solve  $3 \sec x + 4 = 10$  for  $[-\pi, 2\pi]$ .
16. Derive a formula for  $\sin\left(\theta - \frac{\pi}{2}\right)$
17. See problems R5, R6 on p. 281, 282
18. Show  $\csc x = \cot x (\cos x + \tan x \sin x)$
19. Show  $\tan^2 x - \sin^2 x = \sin^2 x \tan^2 x$
20. Show  $(\sin x + \cos x)^2 - 2 \sin x \cos x = 1$

Review especially all vector and word problem homework problems...