

## MATH1060: Midterm 3 Practice Problems

The following are practice problems for the first exam.

- Find all solutions to the following trigonometric equations:
  - $4 \cos^2 \phi - 1 = 0$
  - $\csc \nu + \cot \nu = 1$ . There was previously a typo in this question that made it impossible to solve analytically using the methods we have discussed. It is now fixed.
  - $\tan(3\eta) - 1 = 0$
  - This question was impossible to solve analytically.
- Find the exact value of each of the following expressions:
  - $\sin(\pi/12)$
  - $\tan(165^\circ)$
  - $\cos(18^\circ) \cos(12^\circ) - \sin(18^\circ) \sin(12^\circ)$
  - $\sin \frac{\pi}{12} \cos \frac{\pi}{4} + \sin \frac{\pi}{4} \cos \frac{\pi}{12}$
  - $\cos 75^\circ + \cos 15^\circ$
- Find the exact solutions to the following trigonometric equations in the interval  $[0, 2\pi)$ 
  - $\cos 2\chi - \cos \chi = 0$
  - $\tan 2\nu - 2 \cos \nu = 0$
  - $4 - 8 \sin^2 \mu = 0$
  - $\sin \frac{\rho}{2} + \cos \rho = 0$
  - $\sin \frac{\beta}{2} + \cos \beta = 1$
- Use the power reducing formula to rewrite the expression  $\sin^4 x \cos^2 x$  in terms of the first power of cosine.
- Use the sum-to-product or product-to-sum formula to rewrite each expression:
  - $\sin 5\gamma \sin 3\gamma$
  - $\cos 6\delta + \cos 2\delta$
- Use the half-angle formula to simplify  $\sqrt{\frac{1 - \cos 14x}{2}}$ .
- If  $\sin u = \frac{7}{25}$  and  $u$  lies in the second quadrant, find  $\cos(u/2)$ .
- Use any means you like to solve the triangle with  $\alpha = 24.3^\circ$ ,  $\gamma = 54.6^\circ$ , and  $c = 10.3$ .
- Use any means you like to solve the triangle with  $\alpha = 120^\circ$ ,  $\beta = 45^\circ$ , and  $c = 16$ .

10. Use any means you like to solve the triangle with  $\beta = 63.2^\circ$ ,  $\gamma = 47.6^\circ$  and  $b = 12.2$ .
11. Use any means you like to solve the triangle with  $\alpha = 110^\circ$ ,  $a = 125$ , and  $b = 100$ .
12. Use any means you like to solve the triangle with  $\beta = 100^\circ$ ,  $b = 14$ , and  $c = 19$ .
13. Use any means you like to solve the triangle with  $\alpha = 28^\circ$ ,  $b = 12.8$ , and  $a = 8$ .
14. Use Heron's Formula to find the area of a triangle with side lengths 7, 8, and 9.
15. Use any means you like to solve the triangle with  $\alpha = 50^\circ$ ,  $b = 15$  and  $c = 30$ .
16. Use any means you like to solve the triangle with side lengths 7, 8, and 9.
17. Write the vector,  $\vec{v}$ , with initial point  $(-4, 5)$  and terminal point  $(3, -1)$  in standard form.
18. Write the vector from the last question as a linear combination of the standard unit vectors  $\hat{i}$  and  $\hat{j}$ .
19. Compute the magnitude of the vector,  $\vec{v}$ , from the last question.
20. Let  $\vec{v} = \langle 3, -1 \rangle$  and  $\vec{w} = \langle -1, 4 \rangle$ . Write  $3\vec{v} - 2\vec{w}$  in standard form.