Advanced Trigonometry

Self-Test 1

Allow 25 minutes to complete this test.

1. Find the length of side \( c \) in \( \triangle ABC \) if \( A = \frac{\pi}{4}, \ B = \frac{\pi}{6} \) and \( b = 4 \).

2. Find the size of the smallest angle in \( \triangle ABC \) if the side lengths are \( a = 2, \ b = 4 \) and \( c = 5 \).

3. A hillside slopes at 20° to the horizontal. A 10-metre pole stands vertically upright about halfway up the hill. How long a rope is needed to reach from the top of the pole to a point 20 metres downhill from the base of the pole?

4. Graph the function \( y = f(x) = 2\sin 3x \) noting its amplitude and period.

5. Graph the function \( y = f(x) = \frac{1}{2} \tan x \).

6. If \( \tan x = \frac{4}{3} \) and \( \pi \leq x \leq \frac{3\pi}{2} \), evaluate \( \cos x \) using trigonometric identities.

7. Simplify the expression \( \frac{1}{1 + \cos x} + \frac{1}{1 - \cos x} \).

8. True or false: \( \sin \left( x + \frac{\pi}{4} \right) = \frac{\sqrt{2}}{2} \left( \sin x + \cos x \right) \).

9. True or false: \( \cos(\pi - x) = \sin \left( \frac{\pi}{2} - x \right) \).

10. Show that \( \frac{\sin 2x}{\sin x} - \frac{\cos 2x}{\cos x} = \sec x \).