

1. (5pts) Use an addition formula to find the exact value of $\cos 165^\circ$ (do not use the calculator).

2. (3pts) Find the exact value of the expression (do not use the calculator):

$$\frac{\tan 57^\circ + \tan 12^\circ}{1 - \tan 57^\circ \tan 12^\circ} =$$

3. (5pts) Use a half-angle formula to find the exact value of $\cos \frac{7\pi}{12}$ (do not use the calculator).

4. (9pts) Suppose that $-\frac{\pi}{2} < \alpha < 0$ and $\frac{\pi}{2} < \beta < \pi$ are angles so that $\tan \alpha = -\frac{5}{3}$ and $\sin \beta = \frac{2}{7}$. Use addition and half-angle formulas to find:

a) $\sin(\alpha - \beta)$

b) $\sin \frac{\alpha}{2}$

5. (4pts) Solve the equation (give a general formula for all the solutions).

$$2 \cos \theta + \sqrt{3} = 0$$

6. (5pts) Use your calculator to solve the equation on the interval $0 \leq \theta < 2\pi$. Round answers to two decimal places (answers in radians).

$$\sin \theta = 0.7$$

7. (6pts) Solve the equation on the interval $-\pi \leq \theta \leq \pi$:

$$\sin \theta + \cos \theta = 0$$

8. (8pts) Solve the equation (give a general formula for all the solutions).

$$\sin \theta + 1 = 2 \cos^2 \theta$$

9. (5pts) Establish the identity: $\frac{1 - \tan^2 \frac{\theta}{2}}{1 + \tan^2 \frac{\theta}{2}} = \cos \theta$

Bonus. (5pts) Establish the identity $\tan(\pi - \theta) = -\tan \theta$ in two ways:
a) by using an addition formula
b) by drawing a picture and explaining.