# TEST 11 - MATH 140
# DATE: Friday, March 31
# INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. Each question is worth 5 points. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1.  (a) Sketch the graph of the function $y = \cot x$ in the interval $0 < x < \pi$. (1 point)

    (b) Sketch the graph of the inverse $y = \cot^{-1} x$ based on the previous part. (2 points)

    (c) Find the exact value of the expression $\cot^{-1}\left(\cot \frac{13\pi}{2}\right)$. (2 points)

2.  (a) Establish the identity $1 - \frac{\sin^2 \theta}{1 - \cos \theta} = -\cos \theta$. (2.5 points)

    (b) Establish the identity $\sec^4 \theta - \sec^2 \theta = \tan^4 \theta + \tan^2 \theta$. (2.5 points)

3.  (a) Suppose $\alpha = \sin^{-1} \frac{4}{7}$ Find $\sin \alpha$ and $\cos \alpha$. (1 point).

    (b) Suppose $\beta = \tan^{-1}\left(-\frac{5}{12}\right)$. Find $\sin \beta$ and $\cos \beta$. (2 points)

    (c) Find $\sin(\alpha - \beta)$. (2 points)

4. Compute $\sec\left(\tan^{-1} \frac{3}{4} + \sin^{-1}\left(-\frac{12}{13}\right)\right)$. I want to see **all** the details **neatly written** down. (5 points).

5. Establish the identity

$$\frac{\cos \theta + \sin \theta}{\cos \theta - \sin \theta} - \frac{\cos \theta - \sin \theta}{\cos \theta + \sin \theta} = 2\tan(2\theta). \quad \text{(5points)}$$