

YOUR NAME: _____

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Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Find the exact values (do not use calculators) of the expressions:

(a) $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

(b) $\sin^{-1}\left[\cos\left(-\frac{2\pi}{3}\right)\right]$

(c) $\cos\left(\sin^{-1}\left(\frac{3}{4}\right) + \cos^{-1}\left(\frac{5}{13}\right)\right)$

2. Solve the following equation in $0 \leq x < 2\pi$:

$$2 \sin x \cos x - 2\sqrt{2} \sin x - \sqrt{3} \cos x + \sqrt{6} = 0.$$

3. A surveying team determines the height of a hill by placing in a vertical position a 12-foot pole at the top of the hill and measuring the angles of elevation to the bottom and the top of the pole from the same point at the foot of the hill. If the angle of elevation to the bottom of the pole is 70° and to the top of the pole is 75° , what is the height of the hill? Please show all your work.

- A ship leaves a port at a speed of 16 mph at a heading of 32° (clockwise direction from north). One hour later another ship leaves the port at a speed of 22 mph at a heading of 254° . What is the distance between the two ships 4 hours after the first ship leaves the port? Please show all your work.

5. Consider the following two vectors: $\vec{v} = \langle -2, 4 \rangle$ and $\vec{w} = \langle -3, -2 \rangle$.

(a) Plot those vectors in the Cartesian plane.

(b) Find the vector $-3 \cdot \vec{w}$. (No need to plot in this or the next parts.)

(c) Compute exactly (no decimals) $\|\vec{v}\|$.

(d) Find the vector $\vec{w} - 2 \cdot \vec{v}$.

(e) Find the unit vector in the direction of $\vec{w} - 2 \cdot \vec{v}$.