1. Find the domain of the following functions
   a. \( f(x) = \frac{x^2-16}{(x+4)\sqrt{3x-9}} \) 
   b. \( f(x) = \sqrt{\frac{x-5}{x+5}} \) 
   c. \( f(x) = \frac{x-5}{\sqrt{x^3-125}} \)

2. Prove the following
   a. \( \frac{\cos 2\theta}{\cos \theta - \sin \theta} = \cos \theta + \sin \theta \)
   b. \( 2 \cos(a) \cos(b) = \cos(a + b) + \cos(a - b) \)

3. Find the exact value of
   a. \( \sin\left(\frac{23\pi}{12}\right) \)
   b. \( \cos\left(\frac{19\pi}{12}\right) \)

4. Solve for \( x \): \( \sin 2x = \sin x \) given that \( 0 \leq x \leq 2\pi \)

5. If \( \cos \theta = \frac{2}{5}, \) and \( \pi \leq \theta \leq 2\pi, \) find the value of \( \sin 2\theta \)

6. Draw a vector with initial point \( A(-1, 2) \) and terminal point \( B(-3, 5) \). Find the components and magnitude of \( \overrightarrow{AB} \).

7. Given the vectors \( \vec{a} = 2\hat{i} + 3\hat{j} \) and \( \vec{b} = 3\hat{i} - 2\hat{j} \), find the following
   a. \( |\vec{a} - \vec{b}| \)
   b. \( 3\vec{a} + 4\vec{b} - \hat{j} \)
   c. A vector of length 5 in the direction of \( \vec{a} \)
   d. A unit vector in the direction opposite to \( \vec{b} \)

8. Given vectors \( \vec{a} = (3,2), \vec{b} = (2,-1) \) and \( \vec{c} = (7,1) \). If \( \vec{c} = s\vec{a} + t\vec{b} \), find \( s \) and \( t \).

9. Two forces are acting on an object \( P \). Force \( \vec{A} \) acts along the positive \( x \)-axis with a magnitude of 2 Newtons while force \( \vec{B} \) acts at an angle of \( 60^\circ \) with respect to the positive \( x \)-axis with a magnitude of 4 Newtons. Find the magnitude and direction of the resultant force acting on \( P \).

10. Two ropes are used to suspend a 100 Kg weight. One rope makes an angle of \( 30^\circ \) with the horizon while the other makes an angle of \( 60^\circ \) with the horizon. Find the magnitude of tension in each rope.

11. A man walks due west on the deck of a ship at a speed of 4 mph while the ship is moving N60°E at a speed of 20 mph. Find the direction and speed of the man relative to the surface of the water.