1. (15 points) Let \( p(x) = 2x^3 + 3x^2 - 14x - 21 \).

   (a) Give a complete list of all possible rational zeros.

   (b) Check, using synthetic division, whether \( x = 3 \) and \( x = -\frac{3}{2} \) are actual rational zeros and find all remaining zeros.

   (c) Sketch the graph of \( p \).
2. (15 points) For the following function, find its period and amplitude. Then graph one period of the function and indicate its x-intercepts, its maximum and minimum.

\[ f(x) = \frac{1}{2} \cos (4x - \pi) \]
3. (10 points) If $\cos(\phi) = 12/13$ in quadrant 4, find $\sin(\phi)$ and $\sin(2\phi)$ and $\cos(2\phi)$. In which quadrant does the angle $2\phi$ lie?

4. (10 points) Simplify the following term:

$$\sin(\arctan(x/5))$$
5. (15 points) Consider the function

\[ f(x) = \frac{3x}{x - 2} \]

and find its inverse function \( f^{-1}(x) \). Sketch the graphs of both functions.
6. (10 points) Prove the following identity:

\[
\frac{1 - 2 \sin^2 \phi}{\sin \phi \cos \phi} = \frac{1}{\tan \phi} - \tan \phi
\]

7. (10 points) Find the foci and the center of the following ellipse given by

\[
x^2 + 4y^2 - 4x + 8y + 4 = 0
\]
8. (15 points) Consider the function

\[ f(x) = \frac{2x^2 - 4}{x^2 - 3x - 10} \]

(a) Find the domain of \( f \), all asymptotes of \( f \), and the zeros of \( f \) and \( f(0) \).

(b) Sketch the graph of \( f \).