1. Find the values of $x$ that satisfy each inequality. Use interval notation.
   a. $2x^3 - 9x^2 - 8x + 36 > 0$
   b. $\frac{x-1}{x-7} \leq 3$

2. Given: $f(x) = \sqrt{25 - x^2}$  
   $g(x) = \sqrt{x^2 - 9}$
   Find, or state a reason why the quantity can't be found (show your work below):
   a. the domain of $f$.
   b. the domain of $g$.
   c. $g \circ f (-2)$
   d. $f \circ g (4)$
   e. $f \circ g (x)$  [simplify your answer]
   f. the domain of $f \circ g$.

3. In the following, find a 'simple' expression for $\frac{f(a+h) - f(a)}{h}$ for the given function and the given value of $a$ by simplifying the expression so that the 'h' is eliminated from the denominator: then evaluate this expression if $h = 0$.
   [while you can't have $h = 0$ in the original expression, you can have $h = 0$ in the 'simple' expression]
   a. $f(x) = x^2 + 5x, \ a = 2$
   b. $f(x) = \sqrt{2x + 7}, \ a = 9$

4. Given the function $f(x) = 3x^4 - 16x^3 + 17x^2 + 26x - 10$
   a. List the possible rational zeroes of $f$.
   b. Find the exact values of all the zeroes of $f$; your answers could include both real and complex values.

5. Determine the polynomial of degree 6 whose graph is shown at the right; each mark on the $x$-axis represents one unit. All of the zeroes of the polynomial are integer values. Note the point $(2, 8)$ is on the graph (the polynomial can be left in factored form).
6. The population of a certain town was 14,000 in 1975. In 1980 the population of the town has grown to 17,100. Assume that the population grows exponentially, and that the growth rate remains constant.

a. Find the formula for the population \( t \) years after 1975.
b. Use the formula from part a to estimate the population in 2010 (to the nearest hundred).
c. Assume that the town continues to grow at the same rate. Estimate the year when the population reaches 75,000.

7. Sketch the graph of the following functions. For any periodic function show at least two periods. Label the scales on the axes. Find the key points (intercepts, any maximum and minimum points, points where the graph crosses an asymptote or a 'midline'), and draw and label any asymptotes of the function (horizontal, vertical and/or 'slant').

a. \( f(x) = \frac{4x^2 + 4x - 24}{x^2 + 7x + 6} \)
b. \( g(x) = 4 \cos (2x + \pi) + 1 \)

[Extra credit (10 points): Find the exact x-coordinates of all the x-intercepts of this graph.]

8. Find the exact value of:

a. \( \cos \left( \frac{5\pi}{6} \right) \)
b. \( \tan (75^\circ) \)
c. \( \sin \left( -\frac{\pi}{8} \right) \)
d. \( \tan^{-1} \left( -\sqrt{3} \right) \)
e. \( \sin^{-1} \left( \sin \left( \frac{4\pi}{5} \right) \right) \)
f. \( \cos \left( \sin^{-1} \left( \frac{7}{9} \right) \right) \)

9. Use the fact that \( \cos x = -\frac{7}{10} \) and that \( \frac{\pi}{2} < x < \pi \) to find the exact value of:

a. \( \sin x \)
b. \( \cos 2x \)
c. \( \sin \left( \frac{x}{2} \right) \)

10. Verify the identities algebraically:

a. \( \tan^2 x - \sin^2 x = \tan^2 x \cdot \sin^2 x \)
b. \( \cos (4\theta) = 8 \cos^4 (\theta) - 8\cos^2 (\theta) + 1 \)

11. Find all values of \( x \) in the interval \( [0, 2\pi] \):

a. \( \sin \left( 2x - \frac{\pi}{4} \right) = \frac{1}{2} \)
b. \( \cos (2x) + \cos (x) = 0 \)
12. Find the unknown side (to the nearest tenth of a unit) and the unknown angles (to the nearest degree) of the triangle:

\[ B \]
\[ \beta \quad a \]
\[ 6 \]
\[ 40^\circ \quad \gamma \]
\[ A \quad 11 \quad C \]

13. Two fire towers \( A \) and \( B \) are 10.0 miles apart. Tower \( A \) and fire \( B \) is N45°E (45° east from north) from tower \( A \). A fire is spotted from both towers: its bearing from tower \( A \) is N20°W (20° west from north), and its bearing from \( B \) is N65°W. Which tower is closer to the fire, or are they equidistant from the fire? Find the minimum distance. Justify your answer. The figure to the right is not to scale.