PART I: Answer all 8 questions. Each question is worth 8 points. Justify each answer and show all your work.

1. (a) Find an equation of the straight line that passes through the point (3, 5) and is perpendicular to the line \(2x + 6y = 5\).
   (b) Find the distance between the points A(3, 1) and B(9, 4).

2. (a) Find the center and radius of the circle having equation \(x^2 + y^2 + 6x - 4y + 4 = 0\).
   (b) Sketch the circle in part (a).

3. For all real values, find the domain of each of the following:
   (a) \(f(x) = \frac{x}{x^2 + 4}\)
   (b) \(g(x) = \sqrt{60 - 2x}\)

4. Solve the inequality \(2x^2 - 2x - 4 \geq 0\). Write the solution using interval notation and sketch it on the real number line.

5. Let \(f(x) = 2x^2 - 1\). Find and simplify:
   (a) \(\frac{f(x+h)-f(x)}{h}\)
   (b) \(f(\sqrt{x}) + 1\)

6. Sketch the graph of the function \(y = f(x) = x^2 + 6x + 8\).
   Identify its vertex and \(x\) and \(y\) intercepts on the graph, and clearly label each of these coordinate points.

7. (a) Find all zeros (roots), real or complex, of the polynomial \(P(x) = x^3 - x^2 + 4x - 4\).
   (b) Give the complete factorization of \(P(x)\) in part (a).

8. For the function given by \(f(x) = \frac{3x - 6}{x - 1}\).
   (a) Find the \(x\) and \(y\) intercepts of the graph of \(f(x)\).
   (b) Find the vertical and horizontal asymptotes of the graph of \(f(x)\).
   (c) Use the information above to sketch the graph of \(f(x)\). Plot no more than one point in addition to the intercepts you found in part (a).

Please turn over!
PART II: Answer 4 out of 5 questions. Each question is worth 9 points. Justify each answer and show all your work.

9. (a) Solve the equation and check: \( \frac{2}{x-3} + \frac{4}{x+1} = 1 \)

(b) Factor the following expression completely:
\[ 5x^4 - 20x^3 - 60x^2 \]

10. (a) Write \( \frac{3-2i}{8+5i} \) in the form \( a + bi \), where \( a \) and \( b \) are real numbers.

(b) Solve \( |9x + 8| < 10 \).

11. (a) Solve the following equation and check: \( \sqrt{2 + x} = 2x + 3 \)

(b) Solve for \( x \): \( 3^{(x-5)} = \frac{1}{81} \)

12. (a) Solve for \( x \) and check: \( \log_4(x - 1) + \log_4(x + 2) = 1 \)

(b) If \( g(x) = \sqrt{x^2 - 1} \) and \( f(x) = \sqrt{\frac{4}{x^2 + 1}} \), find and simplify \( (f \circ g)(x) \).

13. (a) Solve the system of equations:
\[
\begin{align*}
2x - 3y &= 11 \\
5x + 2y &= -1
\end{align*}
\]

(b) Simplify and evaluate exactly (no decimal approximations) the following expression: \( \log_3 3 - \log_3 27 + 4^{-\frac{3}{2}} \)

End of Examination