Name:

INSTRUCTIONS: Answer 10 out of 11 problems. Show all work.

1. a) Find an equation for the line through the point \((-5, -3)\) and which is perpendicular to the line \(5x - 6y = 9\).

b) Find the domain of \(f(x) = \frac{\sqrt{x+4}}{x^2-1}\).
2. a) Sketch: $x^2 + y^2 - 14x + 10y + 65 = 0$.

b) Find the term involving $x^8$ in the expansion of $(3x^4 - 2)^5$. 

3. a) Sketch: \( \frac{(x-1)^2}{9} + \frac{(y+4)^2}{25} = 1 \).

b) Find the exact value of \( \tan(\arccos(-\frac{2}{3})) \).
4. a) Sketch: \( y = -2x^2 + 8x - 6 \). Indicate all intercepts.

b) Find the range of \( f(x) = 8^x - 32 \).
5. a) Let $f(x) = 3x^2 - 5x + 7$. Find and simplify the quotient $\frac{f(x+h)-f(x)}{h}$.

b) Let $A$ be in the fourth quadrant and let $\csc A = -\frac{13}{12}$. Let $B$ be in the third quadrant and let $\cot B = \frac{4}{3}$. Find $\cos(A + B)$. 
6. a) Use the rational root test to find all the roots of

\[ P(x) = x^3 + 3x^2 + 7x + 5, \]

and factor \( P(x) \).

b) Express \( \frac{-1 + 7i}{4 + 3i} \) in the form \( a + bi \), where \( a \) and \( b \) are two real numbers.
7. a) Sketch: \( y = \frac{3x-1}{x+5} \). Indicate all intercepts and asymptotes.

b) Solve: \(|3 - 4x| \leq 5\).
8. a) Solve for $x$: $\log_3(x^2 - 7) - \log_3(x - 1) = 1$.

b) Solve for $x$: $\sqrt{4x + 5} + x = 4$. 
9. a) Verify the following identity: \( \frac{1-\cos 2\theta}{\sin 2\theta} = \tan \theta \).

b) Solve for \( x \): \( 4^{x^2+2} = 8^{x+1} \).
10. a) Graph: $y = -4 \cos 2x$, $0 \leq x \leq 2\pi$. Indicate all intercepts.

b) Find the exact value of $(\sec\left(\frac{\pi}{4}\right))^{-6} + \log_7 \sqrt{7}$. 
11. a) Given that \( f(x) = \frac{3-4x}{2x+9} \) is a one-to-one function, find its inverse.

b) Let \( f(x) = 4x^2 - 2x \) and \( g(x) = \frac{1}{\sqrt{x}} \).
Find: (i) \( (f \circ g)(4) \) and (ii) \( (g \circ f)(x) \).

Please indicate which problem you omitted.