1) [5 Points] Find the perpendicular distance between lines $y = -x + 6$ and $y = -x + 12$

2) [30 Points] Solve the following equations. **Find all real and complex roots.**

| a) $\frac{3x}{5} - 5 = \frac{2x}{3} + \frac{4}{9}$ | b) $\sqrt{2x + 13} = x + 5$ |
c) \( x^3 - 8 = 0 \) 

d) \( x^3 - 9x^2 + 20x - 12 = 0 \)  
(Hint: Use Rational Root Test) 

e) \( x - xe^{2x^2} = 0 \)  

f) \( \log_2(x - 3) + \log_2(x + 3) = 4 \) 

3) [5 Points] Given \( f(x) = \frac{1}{2x} \). Find \( \frac{f(x + h) - f(x)}{h} \)
4) [10 Points] Solve the following inequalities. **Write your final answer in interval form**

\[ |2x - 3| \leq 13 \]

b) \[ x^4 - 9x^2 \geq 0 \]

5) [15 Points] Use transformations to sketch the following graphs. **Mark the x- and y-intercepts, domain and range, and asymptotes if present.**

a) \[ f(x) = |x - 3| - 4 \]

\[ y\text{-intercept:} \quad \]
\[ x\text{-intercepts:} \quad \]
\[ \text{Domain:} \quad \]
\[ \text{Range:} \quad \]

b) \[ f(x) = \frac{1}{x^2} - 1 \]

\[ x\text{-intercepts:} \quad \]
\[ \text{Domain:} \quad \]
\[ \text{Range:} \quad \]
\[ \text{Horizontal Asymptote:} \quad \]
\[ \text{Vertical Asymptote:} \quad \]

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c) \( y = -\ln x \)

x-intercept: ____________
Domain: _______________
Range: _______________
Vertical Asymptote: ____________

6) [7 Points] Find the x- and y-intercepts, and horizontal and vertical asymptotes of

\[ f(x) = \frac{x^2 - 7x + 10}{x^2 - 9} \]

Use them to sketch the graph of \( f(x) \).

y-intercept: ____________
x-intercept: ____________
Domain: _______________
Range: _______________
Vertical Asymptote: ____________
Horizontal Asymptote: ____________

7) [8 Points] Given that \( \theta \) lies in the fourth quadrant and \( \cos \theta = \frac{1}{4} \). Find

a) \( \sin \theta \)  

b) \( \tan \theta \)  

c) \( \sin 2x \)  

d) \( \cos 2x \)
8) [5 Points] Sketch the graph of \( y = 3\cos\left(x - \frac{\pi}{2}\right) \). Find the fundamental interval and draw one complete cycle.

Fundamental Interval: 
Amplitude: 
Period: 

9) [5 Points] Verify the trigonometric identity \( \tan x + \frac{\cos x}{1 + \sin x} = \sec x \). 

11) [5 Points] Find the center and radius of the circle \( x^2 + y^2 - 8x + 12y - 4 = 0 \).

12) [5 Points] Find the center, vertices, and foci of the ellipse \( \frac{(x - 5)^2}{25} + \frac{(y + 2)^2}{9} = 1 \).