1) Find the \textbf{x and y coordinates} of all points on the curve \( y = x^3 - 12x \) at which the \textbf{tangent line} is \textbf{horizontal}.

2) For \( r = (1 + \sec(\theta)) \cdot \sin(\theta) \), find \( \frac{dr}{d\theta} \).

3) For \( f(x) = \frac{e^x - e^{-x}}{x} \), find \( f'(1) \).

4) Find an equation for the \textbf{tangent line} to the curve \( y = \left(\frac{\sin(x)}{1 + \cos(x)}\right)^2 \) at the point \( \left(\frac{\pi}{2}, 1\right) \).

5) If \( f(\theta) = \ln\left(\frac{e^\theta}{1 + e^\theta}\right) \) then find \( f'(\theta) \).

6) Find an equation for the \textbf{tangent line} to the curve \( x^3 + y^3 - 9xy = 0 \) at the point \( (2, 4) \).

7) For the function \( f(x) = x^{2/3} \) find the \textbf{y-coordinate} of the \textbf{absolute maximum} point of the curve on the closed interval \( -2 \leq x \leq 3 \).

8) Find the \textbf{x-coordinates} of all the points on the curve \( y = x^3 + x^2 - 8x - 5 \) which are either \textbf{local maximum} or \textbf{local minimum} points. In each case \textbf{state} clearly which one they are.

9) Find the \textbf{critical points} (both the x and the y coordinates) of \( f(x) = x^{1/3}(x - 4) = x^{1/3} - 4x^{1/3} \). Then identify the \textbf{intervals} on which \( f \) is \textbf{increasing} and \textbf{decreasing}.

10) On the curve \( y = 4x^3 - x^4 \) find the intervals on which the curve is \textbf{concave up} and the intervals on which it is \textbf{concave down}.
11) Find the \( x \) and \( y \) coordinates of all the \textbf{inflection points} on the curve \( y = x^4 - 8x^3 + 18x^2 \).

12) Find \( \lim_{x \to 0} \frac{x - \sin(x)}{x^3} \).

13) For the limit \( \lim_{x \to \infty} (\ln(x))^{1/x} \) first \textbf{state} which type of \textbf{indeterminate form} it is and then \textbf{find the limit}.

14) Estimate the area under the curve \( y = \frac{1}{x} \) between \( x = 1 \) and \( x = 7 \) using \( M_3 \).

15) Evaluate \( \int_{-1}^{4} |x - 2| \, dx \).

Recall: \( |x - 2| = \begin{cases} x - 2 & \text{if } x \geq 2 \\ -(x - 2) & \text{if } x < 2 \end{cases} \)

16) Find \( \frac{dy}{dx} \) if \( y = \int_{\tan(x)}^{0} \frac{1}{1+t^2} \, dt \).

17) Evaluate \( \int_{1}^{0} \left(\frac{\sqrt{t} - 1}{t}\right)^3 \, dt \).

18) Using the substitution \( u = x^2 + 1 \) solve the indefinite integral \( \int x^3 \sqrt{x^2 + 1} \, dx \).

19) Find the \textbf{area} of the \textbf{region} enclosed by the parabolas \( x = 8 - y^2 \) and \( x = y^2 \).

20) Find the \textbf{area} of the \textbf{region} enclosed by the curve \( y = x^3 \) and the line \( y = x \).

(\text{Hint: In this problem the top and bottom curves change position in the middle.})