MATH 131 **PRACTICE FINAL EXAM** **FALL 2007**

1) Find the **x and y coordinates** of all points on the curve $y = x^3 - 12x$ at which the **tangent line** is **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 **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 **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 **y-coordinate** of the **absolute maximum** point of the curve on the closed interval $-2 \leq x \leq 3$.

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

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

10) On the curve $y = 4x^3 - x^4$ find the intervals on which the curve is **concave up** and the intervals on which it is **concave down**.

11) Find the x and y coordinates of all the **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 **state** which type of **indeterminate form** it is and then **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 : $|x - 2| = \begin{pmatrix} x - 2 & \text{if} \quad x \geq 2 \\ -(x - 2) & \text{if} \quad x < 2 \end{pmatrix}$

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

17) Evaluate $\int_{1}^{9} \frac{(\sqrt{t} - 1)^3}{\sqrt{t}}\, dt$

18) Using the substitution $u = x^2 + 1$ solve the indefinite integral

$$\int x^3 \sqrt{x^2 + 1}\, dx$$

19) Find the **area** of the **region** enclosed by the parabolas $x = 8 - y^2$ and $x = y^2$.

20) Find the **area** of the **region** enclosed by the curve $y = x^3$ and the line $y = x$.
(Hint : In this problem the top and bottom curves change position in the middle) .