REVIEW 1

1. Compute the derivative of the following functions :

    i) $f(x) = \cos(x^2) + \frac{x^2}{x\sin(x)+7}$ iii) $f(x) = \sqrt{x}\sin(x^2+1)$

    ii) $f(x) = (1 - 2^x)^{\sin(x^2)}$ iv) $f(x) = 2^x \arccos(2x+3)$

2. Compute the following limits :

    i) $\lim_{x\to 0^+} (\sin(x))^x$ ii) $\lim_{x\to 0} \frac{x^2-2+2\cos(x)}{x^4}$

3. A 4π feet long wire is cut into two pieces ; the length of a piece can be 0 ft. One piece forms a circle and the other forms a square. Find where we should cut the wire in order to minimize the sum of the areas of the circle and square. Specify which piece corresponds to the circle and which to the square.

4. Find the slope of the line tangent to the curve of equation $e^{y^3-1} = 7^y \arctan(x) + 1$ at $x = 0$.

5. The function $h(x) = e^x + x^{12/5} - \sin(x)$ has a critical point at $x = 0$. Is it a local maximum, local minimum, or neither ?

6. Consider the function $f(x) = x^2 e^x$.

    i) Find and classify the critical points of $f(x)$.

    ii) Determine the intervals where the function is increasing.

    iii) Find the inflection points of $f(x)$.

    iv) Determine the intervals where the function is concave-up.

    v) Compute $\lim_{x\to+\infty} f(x)$ and $\lim_{x\to-\infty} f(x)$

    vi) Sketch the graph of $f(x)$.