

# MATHEMATICS

Monday November 21 2016

## Eight Exercise Class

1) Find the local minimum and local maximum of the following functions:

a)  $f(x) = x^2 - 6x + 1$

b)  $f(x) = (x + 2)^2(x + 5)$

c)  $f(x) = \frac{x^3}{x^2+1}$

d)  $f(x) = (4 - x)e^{4-x}$

e)  $f(x) = \frac{\ln(x)}{x^2}$

2) Find the intervals of convexity and concavity of the following functions and determine their inflection points :

a)  $f(x) = x^3 - 9x^2 + 1$

b)  $f(x) = \frac{3x^2}{1-x}$

c)  $f(x) = 3x - \sqrt{x-3}$

d)  $f(x) = e^{-x^2}$

e)  $f(x) = xe^{\frac{1}{x}}$

3) Use the L'Hospital's rule to compute the following limits:

$$\lim_{x \rightarrow 3} \frac{x^3 - 9x}{x^4 - 3x^3 - x + 3}$$

$$\lim_{x \rightarrow 1} \frac{3x^3 - 3}{3x - 3}$$

$$\lim_{x \rightarrow 0} \frac{e^x - e^{-x}}{x}$$

$$\lim_{x \rightarrow \frac{\pi}{3}} \frac{1 - 2 \cos(x)}{\pi - 3x}$$

$$\lim_{x \rightarrow 0} \frac{x^3 + \pi x}{\sin(3x)}$$

$$\lim_{x \rightarrow 0} \frac{\ln(1 + 4x)}{3^x - 1}$$

$$\lim_{x \rightarrow 0} \frac{\sin(4x)}{\ln(1 + \sin(x))}$$