

# MATHEMATICS

Monday November 28 2016

## Ninth Exercise Class

- 1) Calculate the Taylor polynomial of the following functions around the point  $a$  and stopping at the order  $n$ :

a.  $f(x) = x^4 + x - 2 \quad (a = 1, n = 3)$

b.  $f(x) = \sin(x) \quad (a = \frac{\pi}{4}, n = 4)$

c.  $f(x) = \log(1 - \sin^2(x)) \quad (a = 0, n = 4)$

- 2) Verify the Lagrange's Mean Value Theorem for the following functions on the specified interval:

a.  $f(x) = x^3 \quad [-2, 3]$

b.  $f(x) = x^2 - x + 1 \quad [-1, 2]$

- 3) Verify Rolle's Theorem for the following functions on the specified interval:

a.  $f(x) = x^2 - 2x - 8 \quad [-1, 3]$

b.  $f(x) = \sin(x) \quad [0, 2\pi]$

c.  $f(x) = 2^x \quad [0, 1]$

- 4) For each of the following functions: study domain, sign, and axis intercepts, find the vertical and horizontal asymptotes, state where the function is continuous and classify (if any) the discontinuity points, find the local maxima and minima, find the intervals of convexity and concavity and determine the inflection points, draw the graph.

$$f(x) = e^{\frac{x-4}{1-x^2}}$$

$$f(x) = \ln \left( \frac{x}{x+2} \right)$$

$$f(x) = \sqrt{\frac{10x-5}{4+4x}}$$

$$f(x) = \frac{x}{\ln x + 1}$$

$$f(x) = \left| \frac{x-1}{x+1} \right|$$

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