

Math 1591 – Sample Test 2

1. State the Mean Value Theorem. Verify the Mean Value Theorem for
 - (i) $f(x) = x^3 - x$ on $[0,2]$
 - (ii) $f(x) = \frac{x}{x+2}$ on $[1,10]$.
2. Using L'Hopitals rule, find the limit of the following
 - (i) $\lim_{x \rightarrow 0} x \ln x$
 - (ii) $\lim_{x \rightarrow \infty} \frac{\ln x}{x}$
 - (ii) $\lim_{x \rightarrow 0} x^{\sin x}$
3. Find the absolute minimum and maximum of the following on the given interval
 - (i) $f(x) = 1 - x^2$ on $[-1,3]$
 - (ii) $f(x) = 2x^3 - 15x^2 + 24x$ on $[0,3]$
4. Find the roots (or solutions) of following using Newton's method
 - (i) $y = x^4 - 3x^2 - 2x - 1$
 - (ii) $\tan x = \sqrt{x}$
5. For the following, calculate
 - (i) The critical numbers
 - (ii) When y is increasing and decreasing.
 - (iii) Determine whether any of the critical numbers are minimum or maximum.
 - (iv) When y is concave up and down and determine the points of inflection.
 - (v) Horizontal, vertical and oblique asymptotes.
 - (vi) Then sketch the curve.
$$y = x^4 - 10x^3 + 24x^2 - 32x - 128,$$
$$y = x^4 - 8x^3 + 6x^2 + 40x + 25.$$
6. A ladder 13 feet long is resting against the wall of a house. The base of the ladder is pulled away from the wall at a rate of 2 ft/sec. At rate is the tip of the ladder moving down the wall when the base of the ladder is 5 ft away from the wall?
7. A paper cup in the shape of an inverted cone with height 10 cm and a base of radius 3 cm, is being filled at a rate of $2 \text{ cm}^3/\text{min}$. Find the rate of change in the height of the water when the height of the water is 5 cm.