I. FIND THE ABSOLUTE EXTREMA FOR THE GIVEN FUNCTION ON THE GIVEN CLOSED INTERVAL.

1. $f(x) = x^4 + 4x^3 - 8x^2 - 10$ on $[-1,2]$

2. $f(x) = \dfrac{x+2}{x^2 + 2x}$ on $[1,4]$

II. USE THE SECOND DERIVATIVE TEST TO FIND AND CLASSIFY THE RELATIVE EXTREMA FOR THE GIVEN FUNCTIONS.

3. $f(x) = x^4 - 4x^3 + 4x^2 - 7$

4. $f(x) = x - 2\sin(x)$ on $(0,2\pi)$

III. FIND THE (OPEN) INTERVALS OF INCREASE AND DECREASE AND THE RELATIVE EXTREMA (IF ANY) FOR THE GIVEN FUNCTIONS.

5. $f(x) = \left(x^2 - 4\right)^{2/3}$

6. $f(x) = x + \cos(x)$ on $(0,\pi)$

IIII. FOR THE GIVEN FUNCTION, FIND:
(A) THE (OPEN) INTERVALS OF INCREASE AND DECREASE
(B) THE RELATIVE EXTREMA (IF ANY)
(C) THE (OPEN) INTERVALS OF CONCAVITY
(D) THE INFLECTION POINTS (IF ANY)

7. $f(x) = \dfrac{x^2 + 1}{x^2 - 4}$ NOTE: FOR THIS FUNCTION, $f'(x) = \dfrac{-10x}{\left(x^2 - 4\right)^2}$ & $f''(x) = \dfrac{30x^2 + 40}{\left(x^2 - 4\right)^3}$

V. USE THE METHODS DISCUSSED IN CLASS TO SOLVE EACH PROBLEM.

8. FIND THE DIMENSIONS OF THE BOX WITH MAXIMUM VOLUME IF IT IS ASSUMED THAT THE LENGTH IS THREE TIMES THE WIDTH AND THE SUM OF THE LENGTH, WIDTH AND HEIGHT IS 120 cm.

9. A FARMER WANTS TO BUILD A SET OF RECTANGULAR LOAFING SHEDS AS SHOWN IN THE DIAGRAM. NOTE THAT THE WALL ON THE NORTH END IS TWICE AS LONG AS THE OTHERS TO BLOCK THE WIND. ALSO, THER IS NOT FENCE ALONG THE DASHED LINES. THERE IS 120m OF FENCE AVAILABLE. WHAT SHOULD BE THE DIMENSIONS OF EACH SHED IF THE SURFACE AREA IS TO BE MAXIMIZED?