

HW #11

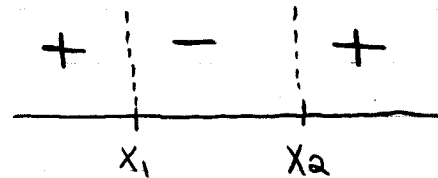
- 1) The maximum value for x in this problem with an $8\frac{1}{2}$ " by 11 " sheet of paper is half the shortest side, which in this case, is 4.25 "

$$V(x) = x(8.5 - 2x)(11 - 2x) + x^3 \text{ on } [0, 4.25] \leftarrow \text{restricted domain}$$

$$V(x) = 5x^3 - 39x^2 + 93.5x$$

1st derivative test

$$V'(x) = 15x^2 - 78x + 93.5 = 0$$



critical #'s are $x_1 = 1.874281965$
 $x_2 = 3.325718035$

since $V'(x)$ changes sign from (+) to (-) at x_1 , this critical # yields a local max. However we use the closed interval method to solve this problem.

x	$V(x)$
0	0
x_1	71.162115
x_2	63.517885
4.25	76.765625 ← max.

The absolute max. volume is 76.766 in^3 which occurs at the end pt. 4.25 .

- 2) The open topped box that results in the maximal case is a strip of paper with dimensions 2.5 " by 8.5 ". (Zero height) This happens because the max. occurred at an endpt. leaving no room ^{for} the height in the open-topped box.

3) $V(x) = x(6 - 2x)(10 - 2x) + x^3$ on $[0, 3]$

$$V(x) = 5x^3 - 32x^2 + 60x$$

$$V'(x) = 15x^2 - 64x + 60 = 0$$

critical #'s are $x_1 = 1.390964752$

$x_2 = 2.875701915$

x	$V(x)$
0	0
x_1	35.000905
x_2	26.818354
3	27

The abs. max. volume is 35.000905 in^3 which occurs at x_1